ILLUSTRATED

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THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

ELECTRIC LIGHT MEN and all those engaged in the **ELECTRICAL TRANSMISSION OF POWER**, and **THE INDUSTRIES ALLIED THERETO**, are hereby notified that the **NATIONAL ELECTRICAL LIGHT ASSOCIATION** has now established **PERMANENT HEADQUARTERS** in **NEW YORK**, at **16 EAST 23d ST.**, from which office the affairs of the Association will be in future conducted. At this office may be found not only the leading electrical and mechanical journals of the world, the Proceedings of the Electrical and other Physical Societies of this country and Europe as well as recognized text books, but also a systematized record of all matters pertaining to the growth and development of the **ELECTRIC LIGHT AND POWER INDUSTRIES.** Manufacturers are invited to send their printed matter to this office, where it will be indexed and placed on file. All persons associated with the electric light or power business are invited to freely consult this office, where any information will be gladly furnished, which does not interfere with work being done for members.

THOSE WHO ARE NOT MEMBERS OF THE ASSOCIATION ARE INVITED TO WRITE FOR PRINTED MATTER SETTING FORTH THE OBJECTS OF THE ASSOCIATION AND EXPLAINING THE REQUIREMENTS FOR THE ADMISSION TO MEMBERSHIP. ADDRESS

THE NATIONAL ELECTRIC LIGHT ASSOCIATION,
16 East 23 Street, New York.

ELECTRICAL REVIEW

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A WEEKLY JOURNAL OF

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The Brotherhood Engine as used with Dynamos.

The Brotherhood engine as now manufactured in this country by the Chester Foundry & Machine Company, of Chester, Pa., is making deserved headway as a motor for dynamo-electric machines. It has many points of merit, not the least of which lies in the facility for direct coupling to dynamos, thus dispensing with all belt troubles and carrying the dynamos over temporary strains due to great reductions in external resistance which sometimes cause a belt to slip for a few seconds, making a disagreeable blink in the light.

The engine has three cylinders, each single-acting, and the connecting rods are pinned directly to a single crank on the central shaft. The pistons receive steam only on their outer ends, and hence the rods are under a continual thrust, which prevents all knocking and consequent wear. Steam admission is controlled by three piston valves which are connected to a single eccentric on the main shaft so arranged as to give steam to each cylinder at about the instant of cut-off of the preceding one, and therefore the crank is substantially receiving continuously the thrust due to the boiler pressure, while also getting the full benefit of expansion. The exhaust posts are ingenious. They are in the piston-heads, and are uncovered by the movement or oscillation of the pin which unites the piston to the connecting rod, allowing the exhaust to enter the crank box. This arrangement is a material advantage. The governor is a throttling device and is attached directly to the main shaft inside the enlargement shown at the right hand end of the engine in both cuts. It is very sensitive and is effective in holding the speed within a two per cent. range, but in special cases can be adjusted to less than a one per cent. range.

All lubrication is positive and automatic, and the result, along with the balancing of strains possible in such an engine, is necessarily an exceedingly small amount of wear, which is so slight as to be unobservable to the eye even after several years regular use of the engine. All the working parts are protected from dirt and dust, and nothing but steam and oil can ever enter the chamber surrounding the crank, and if the oil is of good quality there is no reason for the unequal wear or for grooving in any of the parts. In a 50 horse power engine that has been in use for two and a half years, two bolts have been replaced at a cost of 50 cents, and apart from this the engine is apparently in the same condition it was when first started. The crank pin is perfectly smooth, and there has not been wear enough in the cylinder to efface the faint tool marks left during the boring and polishing of the cylinder when it was manufactured.

The engine is fast coming into favor for electric lighting purposes—it is largely used for that purpose. The search light apparatus on the United States cruisers "Dolphin," "Atlanta," "Boston" and "Chicago" are maintained by Brotherhood engines. Many other engines have also been sold to the United States Government for ventilating fans, and to other parties for steam yachts and for driving dynamos.

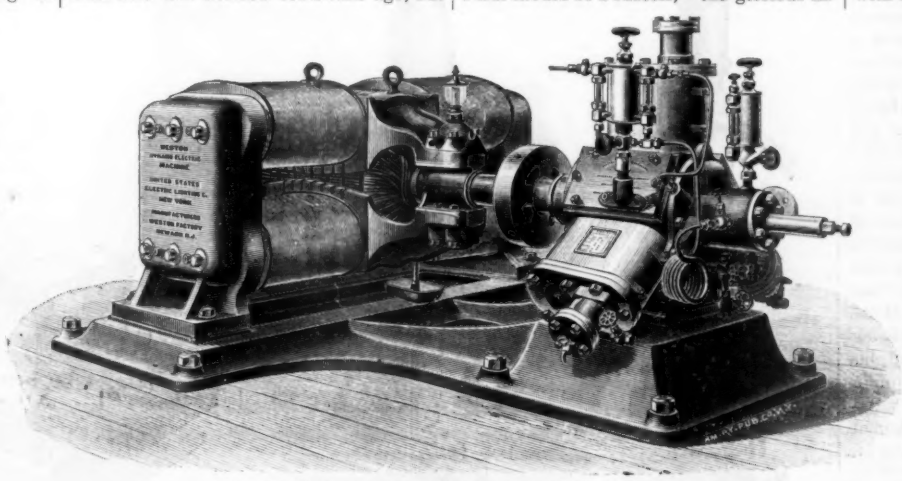


FIG. 2.—BROTHERHOOD ENGINE AND U. S. DYNAMO.

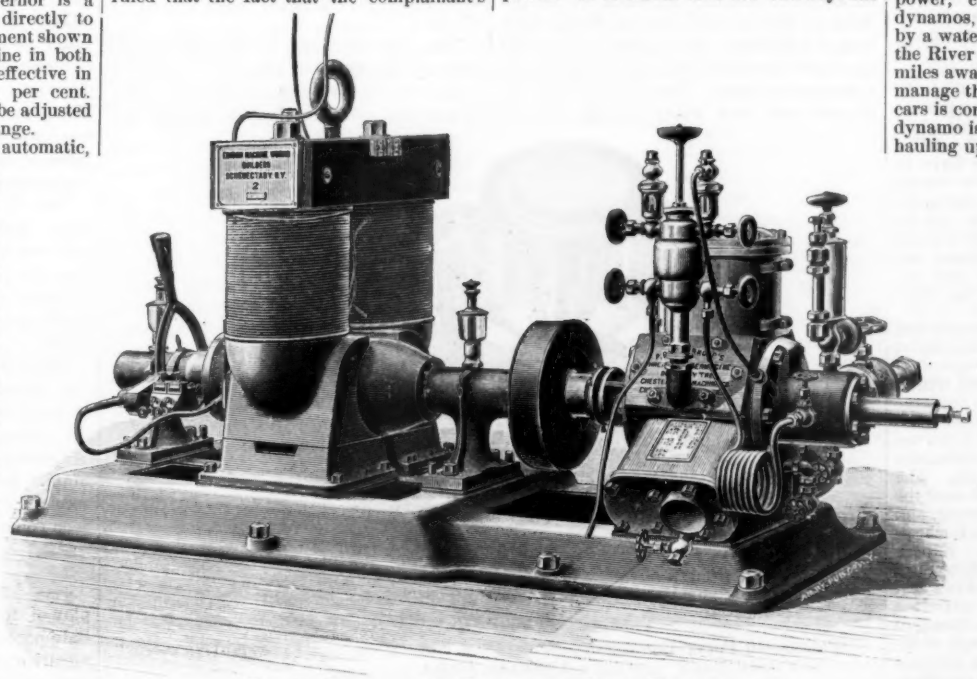


FIG. 1.—BROTHERHOOD ENGINE AND EDISON DYNAMO.

The Bell Company's Victory over Cushman.

Judge Blodgett, of Chicago, rendered his decision in the injunction case of the Bell Telephone Company against the Cushman Telephone and Service Company, last week, sustaining the claims of the Bell Company and granting the injunction prayed for. The main case was decided some time ago, but the present proceedings were begun to force the Cushman people out of several Indiana cities where they operate exchanges. The defendants claimed that the Bell Company had withdrawn its instruments from these towns on the passage of a State law limiting telephone rates. On this point the court ruled that the fact that the complainant's licensees or grantees have withdrawn their telephonic accommodations from these cities does not furnish any excuse or any defense for the infringement of these patents by the defendants. The injunction will not take effect, however, until Jan. 1.

The citizens of Indiana will probably now realize the mistake of their Legislature in driving out the Bell Company by cutting down telephone rentals.

Spain's New Electric Torpedo Boat.

Spain is turning over a new leaf, and preparing to take her place among the naval powers of Europe. She adopts invention at its latest stage, and seeks to push it to its fullest development. She has just launched from the arsenal at San Francisco the very latest edition of the torpedo boat. If the Peral should be a success, "the glorious uncertainty" of naval warfare is indefinitely increased. She will be large—at least 22 meters long—and fast. Her motive power will be supplied by 600 accumulators, and her propelling engines will have 30 horse power. It is stated that for two days she can remain submerged without needing to renew her provision of air. She will be furnished with torpedoes of all kinds, and will herself, if it be desired, be capable of being converted into an immense explosive, fatal to the largest iron-clad. If all this programme can be realized, the days of the invincible Armada seems about to be renewed.

An Electric Mountain Railway.

A correspondent of the London *Daily News* in Lucerne, sends to that paper an account of an electric mountain railway—the first of its kind—which has recently been opened to the public at the Burgenstock, near Lucerne:

Hitherto it has been considered impossible to construct a funicular mountain railway with a curve, but the new line of the Burgenstock has achieved that feat under the superintendence of Mr. Abt, the Swiss electrical engineer. The rails describe one grand curve formed on an angle of 112 degrees, and the journey is made as steadily and as smoothly as upon any of the straight funiculars previously constructed. A bed has been cut, from the most part out of the solid rock, in the mountain side from the shore of the Lake of Lucerne to the height of the Burgenstock—2,330 feet above its level, and 2,860 feet above the level of the sea. The total length of the line is 938 meters (about 3,050 feet), and it commences with a gradient of 32 per cent., which is increased to 58 per cent. after the first 400 meters, and this is maintained for the rest of the journey. A single pair of rails is used throughout, with the exception of a few yards at half distance to permit the two cars to pass. Through the opposition of the Swiss government, each car is at the present time only allowed to run at half distance, and they insist upon the passengers changing, in order, as they say, to avoid collision or accident. A number of journeys were made up and down the mountains in company with the engineer, and the experience is sufficient to prove that the prohibition is altogether unnecessary. The motive power, electricity, is generated by two dynamos, each of 25 h. p., which are worked by a water-wheel of 125 h. p., erected upon the River Aar at its mouth at Buochs, three miles away. Only one man is required to manage the train, and the movement of the cars is completely under his control. One dynamo is sufficient to perform the work of hauling up and letting down the cars containing fifty or sixty persons. At the end of the journey, completed in about fifteen minutes, at an ordinary walking speed, the car moves gently against a spring buffer, and is locked by a lever, without noise and without jolting the passengers. This interesting undertaking has been carried out at a cost of £25,000.

The Fuel Oil Question at Chicago.

The question of cheap fuel for Chicago manufacturers has by no means been entirely settled with the successful operation of the Lima oil-pipe line. Fuel oil can now be had in abundance, it is true, and every day sees its more perfect adaptation to all sorts of purposes for which fuel is used, but the insurance companies have stepped in, and, by raising rates on buildings in which fuel oil is burned, have interfered with its general introduction. These companies have convinced the Mayor, the Commissioner of Public Works and the Chief of the Fire Department that the use of fuel oil is dangerous and have received assurances that permits will not be issued for it indiscriminately. The Board of Underwriters then adopted a rule

that no risk on property should be taken where fuel oil was used, unless the owner had a permit from the Commissioner of Public Works and the building had been inspected by the Superintendent of Survey of the Board of Underwriters, and, even then, only at an advance of one per cent. on the regular rates. A provision in the rule adopted states that an agent may write a policy, under all proper restrictions, when the fuel oil is 300 per cent. proof, but oil of that kind is not used for fuel. An ordinance has also been introduced into the City Council to regulate the distribution of fuel oil within the city limits; but, pipe lines not being contemplated within the city as yet, such legislation is only anticipatory.

This shows that the use of fuel oil in the West will not be very general among manufacturers until the fears of the underwriters are allayed, remarks *Iron Age*. They have some reason for their hostility to this fuel, as shown by recent disastrous fires in various parts of the country, originating, as they allege, from its use. It is their duty to protect the interests of their companies and to reduce fire risks as much as possible, just as well as manufacturers feel impelled to introduce economies in their various lines of business to secure greater efficiency or increased profits. They cannot be censured for such action, as every manufacturer is to some extent interested in maintaining solvent insurance companies. Should his factory burn he wants the insurance for which he has paid. Underwriters who take risks of any degree of hazard are as much to be avoided as reckless men in any other line of business. But the increased rate which they impose in Chicago for permitting the use of fuel oil will, if enforced, prevent its use, because the enhanced cost of insurance may more than offset the saving as compared with coal. This has been the case at the Leland Hotel, in which oil was used with perfect satisfaction to the proprietor and all concerned, but it had to be abandoned when the rate of insurance was raised one per cent.

Insurance companies, like other human institutions, are managed by men who are liable to be erroneously informed or who arrive at conclusions upon insufficient data. It is asserted by the Chicago manufacturers that they have erected storage tanks free of the possibility of explosion, locating them away from all buildings and inclosing them with brick walls, taking every precaution against danger of fire, yet the underwriters have advanced their rates, notwithstanding the belief expressed by experts that such risks were not extra hazardous. To guard against the charge that the insurance companies are seeking to secure an extra profit from their customers under color of the danger attending the use of fuel oil, the underwriters should discriminate intelligently between the person taking necessary precautions and the one using no safeguards whatever. This is the course which should be pursued, and which will ultimately have to be adopted. Insurance companies cannot stand in the way of progress. It would be better for them to promote it. They can do this by the very act of exercising discrimination. The varying rates of insurance, according to the method of using fuel oil, would compel the introduction of the safest and most efficient appliances.

Too much has thus far been accomplished in the vicinity of Chicago in the successful use of fuel oil to let the action of the underwriters interfere very seriously. Both within the city limits and outside of them are large establishments of various kinds, whose managers would be very loth to return to the use of coal after having overcome the difficulties attending the introduction of fuel oil. The Union Steel Company have used oil since the 21st of last March for making steam, and hope soon to perfect arrangements for heating steel ingots and blooms with it. Experiments are in progress at the Joliet Steel Works, and the North Chicago Rolling Mill Company will also probably soon introduce it, pumping their supply from the Standard Oil Company's storage tanks through an independent pipe line to the South Chicago plant. Numerous manufacturing establishments in other lines are using fuel oil, and speak well of it. Its use has almost revolutionized brick making, all the large kilns near Chicago being now burned by oil, with great economy in time, labor and fuel. The absence of smoke is another important result of the use of oil, which makes it a desirable fuel in competition with soft coal. This is a nuisance which Chicago earnestly desires to abate, and the insurance companies should help the citizens in their efforts to get rid of it rather than stand in their way.

The Comstock Mines Adopting Electric Power.

The Brush Electric Company, according to *The Mining Industry*, has shipped to the Nevada mill two dynamos and motors of an improved pattern, that will be able to put upon the stamps 80 per cent. of the power generated at the bottom of the shaft. There are to be six dynamos, one always to be held in reserve, and six Pelton wheels 40 inches in diameter, to be made of phosphor bronze, to drive them, each attached to the dynamo shaft direct. These wheels will be set up at the tunnel level of the mine, in a large chamber already prepared to receive them. A column of water brought down the side of Mount Davidson in a wrought iron pipe will be delivered through a proper nozzle upon the surface of the wheel which stands in the mill, under a perpendicular pressure of about 460 feet. This wheel is 10 feet 10 inches in diameter. After the water leaves the wheel it is piped to the main shaft of the Chollar mine. Down this shaft (and the incline at its bottom) the water is conveyed in two pipes to the electric chamber on the tunnel level. The water will be put upon six wheels under a perpendicular pressure of 1,630 feet. In no place in the world has water been used on a wheel under such a tremendous head. The water will be delivered upon each wheel through a nozzle somewhat less than half an inch in diameter. Each wheel is intended to develop about 125 horse power. This will make a total of some 750 horse power delivered by the six wheels. The fact that this is the first attempt in the history of mechanics to operate water wheels under such an enormous pressure, as well as the fact of the utilization of the power by electrical transmission, will cause the result of the experiment to be everywhere anxiously awaited.

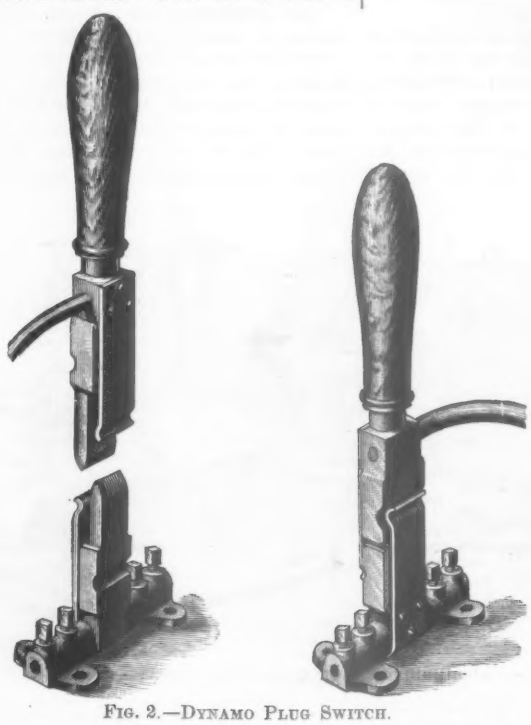


Fig. 2.—Dynamo Plug Switch.

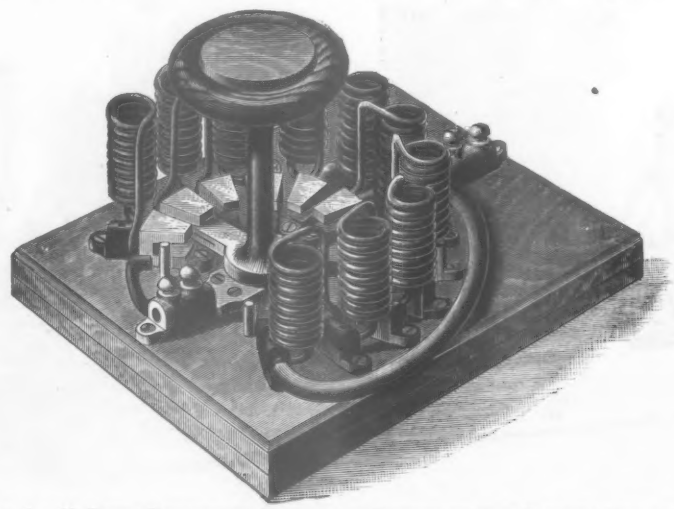


Fig. 1.—10 Point Equalizing Resistance Switch of the Electro-Dynamic Company, Phila.

Electric Lamps for Mines.

There are very few applications of electricity in which England leads this country, but one of them is in portable batteries and lamps for mining work. These are being rapidly and successfully introduced in the collieries of England and Wales; and the following are the details of the most successful of them, taken from a paper of Mr. Nicholas Watts, read before the British Association at its last meeting:—

The Swan Lamp.—Secondary battery: four cells grouped together in a block of gutta-percha, which is enclosed in a wooden case. Luminosity, 1 to 1½ candles for ten hours' duration; weight, seven pounds; price, $6.25; cost of maintenance, seven cents per week. In extensive use in South Wales.

The Schanschieff Lamp.—Single-fluid primary battery: four zinc-carbon cells in a solution of basic sulphate of mercury, about 36 per cent. of the salt being in solution. The solution is sold at one dollar per gallon, and 89 cents is allowed for the same quantity of spent liquid with its solid residue and free mercury precipitated by the cells. Luminosity (with reflector), two to three candles for nine hours' duration; weight, about five pounds; price, $7.50; cost of maintenance, 7½ cents per week. Tested at Cannock Chase, Mardy, Merthyr, and elsewhere.

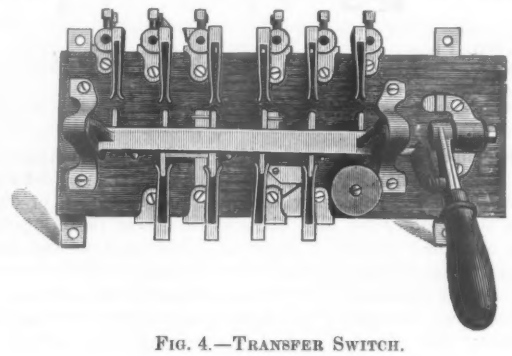


Fig. 4.—Transfer Switch.

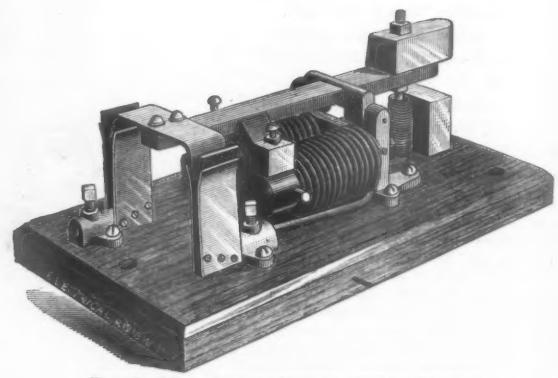


Fig. 3.—Automatic Spring Break Switch.

The Pitkin Lamp.—Secondary battery: four cells. Luminosity (with reflector), four to five candles for ten hours' duration. The lamp is fitted with a switch and resistance to regulate the electro-motive force. Weight, eight pounds; price, $10.50. Used at Llwynypia, Ocean Colliery, Trevicky, and elsewhere.

The Walker Lamp.—Primary battery: three carbon-zinc cells in a strong brass cylinder attached to an outer case of brass or copper. The fluid is a mixture of bichromate of potash, nitric acid and sulphuric acid. Luminosity (with reflector), sufficient to enable newspaper print to be read at a distance of 12 feet; duration, ten hours; weight, seven pounds; price, $8; cost of maintenance, 14 cents per week.

The Portable Electric Syndicate Lamp.—Secondary battery. Luminosity (without reflector), 1¼ candles for 1¼ hours' duration; weight, 4½ pounds; price, $5. The lamp is fitted with an automatic arrangement, whereby, if an outer casing of toughened glass be broken, the current is cut-off to prevent explosion of fire-damp.

The Vaughton Lamp.—Secondary battery. The plates are wedged tightly in the cell, making the battery so compact that it may be subjected to much rough usage without injury. Weight, five pounds; working cost, 14 cents per week; price, $6 to $7.

The advantages of these lamps are, that they do not consume or vitiate the air, they give a steady and more powerful light than the ordinary miner's lamp, and the danger of igniting fire-damp is reduced to a minimum. With the rapid improvements in secondary and primary batteries, they will soon come into universal use.

—— James Haslip, a lineman in the employ of the Brush Electric Light Company, Baltimore, Md., was killed while engaged in repairing a lamp on Lexington street. The back of his right hand came in contact with the current in some manner, and his death was instantaneous.

—— The Duluth, Minn., Electric Company are getting on nicely in putting in their plant. Already the wires are strung in the alley above Superior street, between First avenue east and Seventh west, and on Michigan street, between Second avenue east and Eighth west.

New Electric Switches.

The Electro-Dynamic Company, of Philadelphia, is to be credited with the manufacture of a number of valuable devices for use in electric lighting and particularly with reference to the use of storage batteries. We illustrate a few of the improved switches that the skilled workmen of this company have turned out.

The ten point equalizing switch is used, when charging several series of batteries from one dynamo, to control the quantity of current passing through any one series. A switch is put in circuit with each series with an ammeter, and the handle turned to cut in or out resistance until all the series are receiving the same amount of current, or a different amount if desired.

The dynamo plug switch, illustrated by Fig. 2, is a very substantially constructed switch for connecting a dynamo in a central station to the line, or for connecting two circuits together. It cannot be easily displaced.

Fig. 3 is an illustration of the automatic spring break switch for use in charging batteries on railway trains, or in places where a gravity switch would not be suitable. It has spring contacts, instead of mercury cups, as in the gravity switch, and the spiral spring is adjusted so as to break the circuit whenever the dynamo current has fallen below a pre-determined number of amperes.

The transfer switch, shown by Fig. 4, is used in central station systems to transfer a battery which has become fully charged from the charging circuit to a common discharging circuit.

SOUTHERN ELECTRICAL NOTES.

(Special Correspondence.)

Mr. J. L. Hand, a merchant of Pelham, Ga., has entered suit in the city court of Atlanta, against the Western Union Telegraph Company for $3,000, which he lost by a mis-directed telegram.

A lineman of the Western Union Telegraph Company, who is engaged in stringing a copper wire from New York to Jacksonville, through Augusta, Ga., gives information that this is the only copper wire the company has in the South.

Mr. George A. Langworthy, who for seven years has been connected with the Southern Bell Telephone and Telegraph Company of Atlanta, Ga., has left for Sheffield, Ala., where he goes to assume the management of the Sheffield, Florence and Tuscumbia exchange. Mr. Langworthy is a thorough and practical telephone man, and under his able management these three exchanges will be operated with all efficiency.

The telegraph line on the Rome and Decatur road has been completed. Offices will be opened at Rome, Gadsden, Attala and Cedar Bluff. This line is owned by the Rome and Decatur road.

E. G. Stevens, Jr., W. C. Harris, Jr., and W. H. McClellan, all of Birmingham, filed a declaration in the office of the judge of probate, on the 16th of October, for a charter for the Stevens Electric Company, capital stock $10,000, divided into 100 shares of $100 each. The company propose to do a general electrical business, embracing the right to furnish electric lights, both arc and incandescent; also to sell and rent electric motors for the purpose of furnishing electric power for the same.

There is a move in Spartanburg, S. C., among the business men, to substitute electric lights for the present gas lights on all the principal streets.

Samuel McIntyre, an employé at the electric light works, at Savannah, Ga., while under the influence of liquor, attempted to commit suicide by taking morphine. He was discovered and physicians were summoned in time to save his life. A love affair is said to have been the cause

A complaint against the Western Union Telegraph service at Charleston, S. C., was forwarded by a committee, both to the manager of the Western Union Company, at Augusta, and also to New York. The points made against the service, are, delay in the transmission and receipt of telegrams and cablegrams, incorrectness, illegibility, and loss of telegraphic correspondence. It is not expected that a reply will be received, until the matter has been thoroughly investigated.

A suit has been instituted against the Western Union Telegraph Company, at Charleston, S. C., in behalf of Samuel Henning a colored boy aged 15 years, for $15,000 damages. The boy had his fingers badly burned by a telegraph wire becoming crossed with an electric light wire.

The Athens, Ga., Gas Light Company, previously mentioned, will put in an electric plant at once; cost to be $15,000.

The Savannah, Ga., Electric Light Company will put in additional dynamos. They are putting in new boiler, and have lately put in 125 horse power engine.

The Granite Falls Manufacturing Company, of Granite Falls, N. C., have purchased electric light machinery for their cotton mill; capacity, 225 incandescent lights.

The Salem, N. C., Iron Works have ordered electric light machinery for their works.

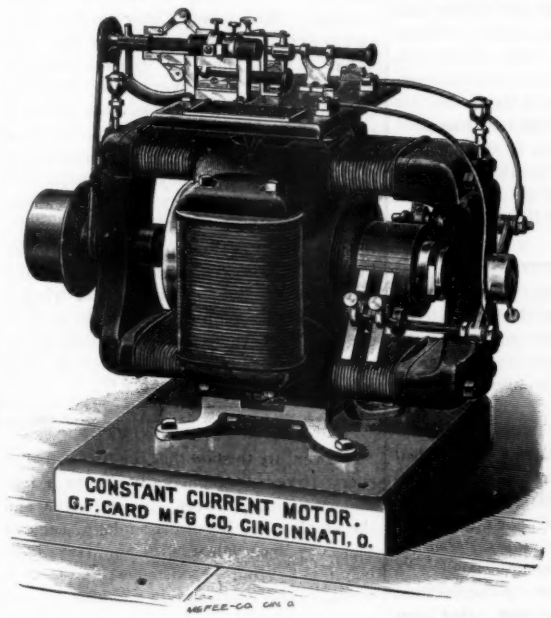
The Fort Worth Electric Manufacturing Company, Fort Worth, Texas, has been chartered with a stock of $100,000.

At Richmond, Ga., the Virginia and North Carolina Wheel Company have purchased electric light machinery for their factory. The capacity is for 75 incandescent lights.

The Gainesville Gas and Coal Co., Gainesville, Texas, have increased their capital, and changed their name to Gainesville Light and Fuel Company, and will add electric light plant to their former business.

EDWARD A. OLDHAM.

Charleston, S. C. Oct. 30.



Instantaneous Steam Generation.

M. Georges Lesourd, in *Le Genie Civil*, describes a novel boiler for instantaneous steam generation, the invention of MM. Serpollet Frères. In this boiler the sudden evaporation of small quantities of water between two heated metallic surfaces placed close together is utilized for generation of steam power for small engines. The boiler consists in essence of a long stout copper tube, which has been passed through rollers while hot until the sides are pressed together with only a capillary space between. This long flat tube is then coiled in three convolutions inside a furnace space, where they can be heated to a high temperature. The outer end of the copper tube remains still circular in section, and through this tube, heated to 600° F., water is injected, turning immediately to steam. The cubical contents of the capillary aperture being small, the force of the steam in case of rupture would be harmless. There are no tubes, rivets or joints to get out of order, and the utmost simplicity and security is obtained. The boilers are not made at present over two h. p., though the same principle might be applied to greater powers, and the usual size made is one h. p. This is about equal to the size of an ordinary stove, being 16 inches diameter, and about two feet high and weighing 245 pounds; it has been used for running small tools, pumps, etc., and could be used for dynamos for small installations of six or eight lamps. The tube for this size before flattening is two inches diameter, $\frac{7}{16}$ inches thick, and six feet six inches long. If this steam generator proves entirely satisfactory and practical, there is evidently a wide field of usefulness before it; for a small, simple, and secure steam boiler for use with small engines, one, moreover, which can be used with mineral oil if desired, is a very great desideratum. It is intended to fit up one horse boilers with engine and dynamo on the same bed-plate.

A New Electric Motor.

Geo. F. Card, of Cincinnati, has been a worker in the electrical field for several years, and has recently brought out the electric motor illustrated on this page. The motor is reported to have been subjected to severe tests, and in every instance satisfied its builders. This motor possesses a method of speed regulation that is simple, yet new and desirable. It consists of a differential coil of low resistance in shunt relation to series magnetizing coil, and a centrifugal governor driven from the armature shaft by means of a rubber belt made expressly for the purpose. One end of the differential loop terminates at the carbon point, held securely in a suitable bracket movable on a line with the governor shaft. By means of a screw the other end also terminates at a carbon point, which, with its holder, forms part of the governor mechanism. In starting the motor this part of the governor is open and the current flows through the direct series coil, quickly increasing the speed until the two carbons are brought in contact; then the current divides, part flowing through the differential coil and part through the direct coil; the ampere turns in the former, being sufficient to neutralize the effects of the latter and demagnetize the field. The tendency is for the armature to stop, but the slightest reduction of speed acts to separate the carbons and bring into full effect the current in the direct coil which quickly pulls them together. As a matter of fact the shunt coil is never completely open, the governing carbon keeping up a constant vibration. The carbons are of the finest quality and are one inch in diameter. By means of a thumb screw the fixed carbon can be moved backward or forward to increase or diminish the speed. In case the governor belt should break or fly off the arms will collapse and close, the reverse coil stopping the motor at once.

—— The San Francisco *Lumberman and Contractor* says: "The Nevada City trustees refused to pay the increased price demanded by the electric light company, and orders have been given to shut off the current and take down the lamps."

—— At the annual election of the Electric Light Company of Berkeley, Cal., M. B. Curtis was re-elected president, J. L. Scotchler, secretary, and the following-named gentlemen were chosen as directors: J. L. Barker, M. B. Curtis, W. E. Sell, Louis Gottshall, J. K. Stewart, J. L. Scotchler, H. W. Taylor, A. F. Gunn and C. K. Clark.

—— Architect R. W. Hill, of Waterbury, Ct., has completed the plans for a new building for the Connecticut Electric Light Company. The contracts have not yet been given, but the building will be constructed this fall. It will be located on Bank street, opposite the works of the Plume & Atwood Manufacturing Company, and a little south of the present electric light works. The building will have a frontage of 50 feet 8 inches, and will be 252 feet in depth. It will be one story high, constructed of brick, with asphalt floors, and an iron roof to be put on by the Berlin Iron Bridge Company. The building will be absolutely fire proof. It will be built in two sections. The boiler room will be 68x50 feet in dimensions, with a height of 18 feet. The dynamo room will be 180x50, and 14 feet high. The capacity of the present works is 1,200 incandescent lights and 230 arc lights. The new works will have a capacity of 3,500 incandescent and 400 arc lights. The works will be arranged with a capacity of 300 horse-power motors. Three new Corliss engines of the most improved pattern will be put in, and have a 1,000 horse-power capacity. In the dynamo room will be 14 arc dynamos, 12 incandescent dynamos, and four power generators.

Hatton, Kan.—The Hatton Electric Light Company, of Hatton. Capital stock, $20,000.

Wichita, Kan.—The Citizens' Electric Light Company, of Wichita. Capital stock, $100,000.

New York City.—The National Electric Construction Company, of New York; capital stock, $20,000.

Johnsbury, Vt.—The Vermont Standard Electric Company has been organized; capital stock, $400,000.

New York City.—The Bulen Watch, Clock and Electric Company, of New York City; capital stock, $25,000.

Boonville, N. Y.—The Boonville Electric Light and Power Company, Boonville, Oneida County; capital, $10,000.

Chicago, Ill.—The Pumpelly Storage Battery and Motor Company, of Chicago; capital $300,000; James K. Pumpelly and others incorporators.

Eau Claire, Wis.—The National Electric Manufacturing Company, of Eau Claire; capital, $50,000; R. E. Rust and others incorporators.

Chicago, Ill.—The Fuel Gas Company; capital stock, $1,000,000; incorporators, John T. Hanna, Alvin M. Mathershead and Edwin Blix.

Chicago, Ill.—The Liquid Carbonic Acid Manufacturing Company; capital, $75,000; directors, Jacob Baur, Oscar Baur and Adolph Convers.

Indianapolis, Ind. — The Incandescent Light Company has been incorporated here; capital, $400,000; Joseph B. Mansur is one of the directors.

Camden, N. J.—The Taylor Gas Producer Company filed articles of incorporation with an authorized capital of $500,000, of which $1,000 is to be paid in.

Chicago, Ill.—The Decatur Electric Street Railway Company, of Chicago; capital, $100,000; incorporators, E. T. Martin, C. M. Barclay and F. Sargent.

Kenosha, Wis.—The Kenosha Gas, Electric Light and Fuel Company, of Kenosha; capital, $50,000; incorporators, Julius H. Kimball, Edgar G. Hozelton and E. N. Kimball.

Albany, N. Y.—The amended certificate of the Manhattan Electric Light Company, limited, of New York, capital $100,000, was filed with the Secretary of State at Albany last week.

Washington, Pa.—The Washington Carbon Company. The incorporators are C. M. Reed, A. M. Todd, C. M. Brady and others. Will manufacture electric light carbons and battery supplies.

San Francisco, Cal.—The Pacific Edison Phonographic Company; capital, $720,000, and the following directors: John I. Sabin, Louis Glass, Louis H. Jacobi, John A. Mallon and Robert T. Stevens.

An Original Electric Light Man.

One of the experiences Mr. Cole had in lighting up Buffalo Bill's show is worthy of mention and proves the old adage: "Any port in a storm." The first night the lights were turned on it was found that the light was not concentrated enough to enable the "crack shots" to see their glass balls, and it was necessary to have some search lights or focus the others on the space to be lighted. He obtained six locomotive head-lights and endeavored to so place them behind the six lamps on the grand stand so as to concentrate the light. It was a failure and he was in despair. As an emergency he sent a man down town post haste for a dozen ordinary new dish pans. These were nailed up behind the lamps and the result was astonishing. It was just the thing. Twenty-five more were obtained at once and placed behind the pole lights and the result was a perfect illumination; so much so, that he was complimented over having given the Buffalo Bill party the best light since they left London.

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EDITORIAL ANNOUNCEMENT

Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, NOV. 10, 1888.

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The Cincinnati Electrical Society has been incorporated.

The REVIEW has endeavored to get out of the way of the National election by going to press a little earlier, and mailing this edition Monday evening. If any of our readers are not satisfied with the political outcome, we trust they will receive due electrical solace by reading the REVIEW two days earlier.

The next regular meeting of the Electric Club will be held November 15th, at which time a lecture on a most interesting and prolific topic—"Lightning"—will be delivered by Dr. Moses G. Parker, of Lowell, Mass. The lecture will be illustrated by the stereopticon, and will naturally provoke discussion.

It is a significant fact that the Whitechapel district of London is entirely devoid of electric lamps, and that several times attention has been called to the fact that crime would be less prevalent in that district if arc lights were plentifully used. An English journal of repute has gone so far as to say that the horrible and atrocious murders which have recently been perpetrated in that region, and which have shocked the whole civilized world, could never have been performed, nor could the murderers have escaped detection if the arc lamp had been there. In this country it has been demonstrated time and time again that the arc lamp is an indispensable guardian of the public safety, and that the more you make the night resemble the day the more the safety of the night will resemble that of the day.

The eminent electrician, Prof. W. H. Preece, of England, wants all the physicists and scientists generally to stop using the word electricity as applied to a number of things, in regard to which he prefers the term "coulombism," which is of his own invention. He says you must not say electricity when you mean "one factor of electrical energy," nor "the ether which fills all space," nor "that mysterious something which permeates the ether," nor "a form of matter purely imaginary and *sui generis*," nor "a something that is associated with each atom of matter," nor "a special fluid that has no real existence," nor "that form of energy we call current—*et id genus omne*"—this is all coulombism. Electricity is entirely different; it is a commodity which we buy and sell, it is something which can be given away or stolen or lost. It has a purely objective existence. Well, perhaps it is so. We confess to being a little mixed on the subject ourself, and do not care to go into the argument.

Mr. William Hallock, the scientist, has often been annoyed by the severe criticisms of a Belgium chemist named Spring; an acute observer, be it said, and a learned one. Mr. Hallock read a paper before the Washington Philosophical Society last spring on the formation of alloys at lower temperatures than the smelting points of either of their constituents. Now, Brother Spring, having lots of jump in him, as his name would imply and some ascerbity as well, wrote an elaborate paper in which he sought to prove Mr. Hallock mistaken in his premises, propositions, postulates, not to mention his conclusions and a few other things. Mr. Hallock struck back promptly by examining the method adopted by Mr. Spring, of Belgium, of discrediting his theory of the making of alloys. He put "potassium and sodium in contact, arranging a thermometer to register the temperature; as they united the temperature fell 2°.4 C. below that of the room. A block of ice and one of rock salt, the temperature of each being reduced 10° or 12° C. below the melting point of the ice, when brought into contact, began immediately the formation of the solution of salt." Some think Hallack has him on the hip, but those who know Spring say he has the sudden recoil of the business end of a mule. When he comes back this time, look out for flying chemistry symbols and five syllabled corkers!

A SURPRISING ELECTRIC CURRENT.

In these days of ever-recurring "chestnuts" the following from the Brockton *Enterprise* is as startling as a lightning flash on the black curtain of the night:

Some citizens have doubted the practicability of Chief Engineer Eaton's recommendation that the big copper wires of the East Side Company be insulated, as they claimed that the trolley must run on the bare wire in order to get the current. This, an electrician states, is not the fact. The electric current does not, of course, run in the wire, but merely runs parallel with the wire, which is a conductor. The covering would be a benefit instead of a hindrance because it would confine the current more closely to its course and would prevent any diffusion or waste. The trolley can take the current from this feed-wire whether it is covered or not.

This at least is no chestnut. The aforesaid chief engineer and electrician (?) have made a discovery—a big step towards the millenium dreamed of and longed for by us all. At one fell swoop insulation, the *atra cura* of the practical electrician is to be metamorphosed in its functions. They have had to invent a new kind of electricity, but what matters that? Their electricity does not run *in* the wire, but has wheels or legs and merrily rolls along or scampers over the conductor like a monkey over a rope. Contact devices do not need to touch the wire. What a fine thing for dynamo makers, whose *bête noir* has always been the pesky commutator, which they can now throw in the scrap pile. But why use the overhead style? Why not bury the wires and let the car wheels act as trolleys? Perhaps they mean to make the trolley do duty as a converter, to convert this recalcitrant jack-in-the-box sort of current to the plain every-day kind which leads a strictly sober life and does not go reeling out in the cold when it can find a nice comfortable straight path in a copper wire where it meets nothing but an ohm once in a while. We hope to hear more of this latest "discovery."

INDUSTRIAL COMITY.

We venture to state that the first cause of every strike is fundamentally due to a misunderstanding between the employer and the employed. Naturally enough, each of them, in accordance with the law of his being, is fighting for existence; and there is a competitive emulation in mankind as well as an antagonistic emulation, which is the foundation of the doctrine of the survival of the fittest, controlling the action of both mankind and animal.

All business is founded on confidence, and it is as necessary for the relations pertaining to the sale of labor as it is to the sale of merchandise or money.

It is doubtful whether a person can control others in all judiciousness and equity, unless he has been in the position of those under him. An employer who takes a personal interest in his men, is repaid with faithfulness, with rarest exceptions, which occur through misunderstandings.

It has been said that the rich ought to know how the poor live, and the poor ought to know how hard the rich have to work. The unrecorded instances of faithful disinterested work on the part of the employer are almost numberless, and some of them have become known after a lapse of time sufficient to show the results.

James Bowditch, the great navigator, possessed in a degree never shared by any other man, the wonderful power of reducing astronomical principles necessary for use in navigation to terms of such simplicity that they could be used with but little preliminary training by persons who had never received the advantage of advanced mathematical instruction. When Bowditch was captain of a vessel on a voyage to the East Indies, he offered to give instruction to such of the men as desired. A majority of the crew expressed a willingness to receive such instruction and were divided off into classes, and at times compatible with their duties to the ship, he instructed them in navigation. It has been said that the majority of those men became masters of vessels, and the remaining rose to at least a mate's position.

When the late J. C. Hoadley, the civil engineer, was engaged in his younger days in building the mills at Clinton, Mass., he gave instruction in mechanical drawing to a number of the young men engaged on the work, and it has been said that every one of those young men who completed the course, and whose life was spared to mature years, has risen to some position of authority in manufacturing or engineering.

A few months ago a manufacturer of electrical apparatus in Boston, noting the discussions and inquiries among his men during the noon hour respecting their work, and believing that the value of labor increases with intelligence, offered to devote twenty minutes of every noon hour to a talk upon the principles of electricity and their application, the men being allowed to ask questions.

The lectures were very instructive to the men, and it is true that the searching questions on the part of the men were enough to put the employer at times to his wit's end, not merely for the purpose of answering the questions at the time, but also in making diligent search for the knowledge and experience of others upon points which were raised during the discussions.

THE FUTURE OF THE JOBBER.

Is the jobber declining? is an interesting inquiry, and because of the general interest now taken in it throughout the hardware and kindred trades, and the free expression of opinion among those personally involved in the issue, we are given access to a mass of data of an official and authorative kind. The inclination of the retailer to buy from the manufacturer, and in the West, particularly, from local rather than Eastern jobbers, has long been evident, and, nothwithstanding the determined efforts that have been made by Chicago and St. Louis to absorb the jobbing trade to the west of them, the jobber has held his own on the great highway to the Pacific. Generally speaking there are two kinds of manufacturers; the one giving no encouragement to the retailer, so that the jobber, who is general distributor may be protected and the other who maintains a sort of sub-rosa relationship with the retailer. The evil of this sort of thing is best shown in the constant bickerings in country towns, where he who has bought from the manufacturer is underselling his neighbor buying from the middleman, and as the strength of a chain is not greater than that of its weakest link, so the lowest price that the manufacturer has been privately quoting is all the jobber can thereafter get for a standard article. It seems to be true that the jobber is declining hereabout, but that fact does not necessitate his gradual extinction. By no means. He may be, and indeed we learn beyond peradventure that he is, going West, and were we bold enough to hazard an opinion, we should say that the causes which brought him into existence are likely to sustain him. He buys large quantities of goods from the manufacturer, often paying cash for them, and hence the retailer, who has, generally speaking, small means, can never compete with him in buying from a manufacturer who has the slightest regard for his own interest. Again, the retailer always has a stock of goods in hand whilst the manufacturer must have timely notice in order to make them. As a result, many retailers, if not most of them, instead of keeping a good stock of goods for which there is a ready sale, have become accustomed to buy only to supply their immediate wants, thus making the jobber pay their storage bill, though doubtless it all comes out of them in the end, as indeed, it ought to. From all this we should conclude that the jobber is not declining.

Personal.

Mr. Edward Backus, Rochester, N. Y., has invented an electric car brake.

Mr. Howard Stockton and Mr. John E. Hudson, president and general manager respectively, of the American Bell Telephone Company, were New York visitors last week.

Prof. Frank Van Vleck, formerly connected with the department of Electrical Engineering at Cornell University, is actively engaged in electrical work at Los Angeles, Cal.

OUR CHICAGO LETTER

(Special Correspondence.)

It was hardly to be expected that the Chicago Telephone Company would quietly accept the ordinance passed by the City Council, and in fact the Mayor openly stated that he did not anticipate such action on the part of the company.

The company now refuses to accept any new orders for telephone service, and will not, while the present muddle exists. The officers of the company say that they refuse because they have no ordinance under which they can do this.

Per contra, the aldermen who were instrumental in passing the ordinance say the telephone company will have reason to regret this species of tactics. According to one of our daily papers there will be a "strong demand made on the legislature at its next session, to empower City Councils to regulate the rental of telephone sets, and fix a license fee for the same. The powers of municipalities are more circumscribed in Illinois than in other western states. It is useless to attack the company in the courts. Its attorneys can prolong litigation until the patent expires, and the Legislature offers the readiest means of attack."

Representatives from other parts of the State will reinforce the Chicago members, it is claimed, and aid in rescuing the "poor, down-trodden people from the crushing weight of the heel of this terrible death-dealing monopoly!" If that doesn't paralyze the Bell people, what can be hoped for from words?

The Chicago *Herald* is never anything unless sensational. It deals in the marvelous, the thrilling and high colors generally. On the 28th it contained the record of an interview with Mr. Geo. A. Mayo, electrician of the Van De Poele Electric Company here, which nearly takes one's breath away. In the course of the interview Mr. Mayo is made to say in reference to a shock which he received at a potential of 3,200 volts and lived.

"This was two years ago. I was at that time electrician of the Narragansett Electric Light Company, at Providence, R. I., and it happened in this way: I took hold of one of the brushes of a Thomson-Houston dynamo for the purpose of adjusting it. It was raining at the time. Unknown to me one of the wires had come in contact with a tree, and a part of the current followed the water on the tree to the ground, making what is technically called a second ground. You know an electric current has always a tendency to reach the ground. In touching the brush I received a shock. It wasn't a very severe one, but it threw me directly on the machine itself, rendering me perfectly powerless and unconscious. During the period of my insensibility I removed the brushes of the machine by the convulsive motion of my hands. This, if anything, ought to have killed me, but subsequent events showed it didn't."

Asked as to what protected him from instant death, Mr. Mayo said: "I ascribe it to the extreme resistance my body made against the current. That resistance was 8,000 ohms, the highest I've ever known or heard of in a human being."

Mr. Mayo, the boys say, could never get a railroad situation, because he such a poor conductor, don't you see?

The western terminal of the REVIEW is the recipient of one of the finest pieces of artistic advertising the electric light business has ever seen—the Westinghouse Catalogue. Speaking after the manner of botanists, it is a daisy, and will be preserved in my electrical herbarium.

A new "system of generating, transmitting and utilizing electrical energy, as applied to arc and incandescent lighting, galvanoplastic work, motors, steel railway propulsion, and the general transmission of power," is just about to be sprung on the electrical public by a Chicago company, but the vexatious delay at Washington, the approaching election and other hindrances, are keeping the patents back.

Messrs. Seafert & Company are the promoters of the system, and should they accomplish in actual practice what they claim, a new departure in electrical matters will be made manifest very shortly.

The Western Electric Light and Power Company, of Toledo, Ohio, has just made an addition of 200 lamps to its plant, and is now running 500 lamps in all. The addition is for municipal lighting. As the name of the company indicates, the plant is one of the Western Electric system.

Frank Stewart, formerly of the Western Electric Company, after a few months absence in another line of business, has returned and will hereafter be found at his old place. The boys missed Frank, and are pleased to have him return.

At the regular meeting of the Chicago Electric Club, on the 29th, Mr. C. C. Haskins read a paper by request, on "The Universality of Vibrations." The attendance was good, and the paper was well received.

Chicago, Nov. 3. 1888. C. C. H.

OUR BOSTON LETTER.

(Special Correspondence.)

The management of the New England office of the "C. and C." Motor Company has been assumed by Mr. H. A. Howard, Mr. G. E. Claflin, the former manager, being now with the Waterhouse Electric and Manufacturing Company, of Hartford. The Agency is putting in a large number of ¼ horse power motors which are performing most varied duties. A peculiar case was presented recently, showing the convenience of electric power. Power is available at certain periods in a small manufactory, but at times when most needed is unobtainable. It is proposed to place a "C. & C." motor there which will be used as a dynamo charging accumulators, when power can be used, and when work is to be done afterward the current will pass again through the machine which will now, acting as a motor, give out the stored energy.

The Woonsocket Spool & Bobbin Company is making some beautiful models in fancy woods, perfect in all details, of electric cars for railway use. Orders are also being filled for some very nice instrument cases and meter bases for the Western Electric Instrument Company, of Newark, N. J., and the Troy, N. Y., Electrical Works.

The Electric Club meets this evening to consider the matter of new club house and for the transaction of other important business. On Tuesday evening full election returns will be received at the rooms, and the next informal talk will be on November 14, when F. J. Parsons, Ph.D., will address the club on "Central Station Practice in Germany."

The Sawer-Man Company, have contracted for the following plants during the past weeks: C. D. Morse & Co., Milbury, Mass., 65 lights; Perry Mason & Co., Boston, 100 lights increase; Fisk's Wharf, Boston, 100 light dynamo.

The advance copies of the new Thomson-Houston catalogue have appeared, and show it to be a model of clear and concise descriptive statements, combined with artistic design and typographic excellence. The cuts, which are largely new, are exceptionally good, and illustrate, beside the lighting and power apparatus manufactured, the wonderful growth of the company as shown in it, steady increase of factory facilities.

Orange, Mass., has taken very kindly to electric illumination, and the power plant will have to be doubled in a short time. Large increases are also reported from Thomaston, Me., and many other New England towns.

Mr. L. C. Burnham, of the Electric Gas Lighting Co., has been obliged to give up for the present a proposed Western trip, pressure of business pouring in upon the home office, requiring his attention here.

Mr. S. M. Hamill, the New York agent of the Brush Company, was in town Saturday, in consultation with Mr. C. S. Haley, occupying the same position for New England.

The paper before the Electric Club on Wednesday evening by Mr. I. H. Farnham on "Telephone Switch Boards," proved very interesting. Mr. Farnham's remarks were illustrated by the use of apparatus and drawings.

Boston, Nov. 5th, 1888. T. W. S.

A Voice from the Telephone Manager about Telephones.

TO THE EDITOR OF ELECTRICAL REVIEW:

Much has been said in regard to the use of the telephones, still there is room for its merits to be more fully explained in order that they may be more highly appreciated.

THE TELEPHONE IN CASES OF SICKNESS.

There is a prominent business man, a resident of Peachtree, who says: "Upon one occasion my little boy was dangerously sick. I called up the third physician's residence before I found one at home. Soon as I told the doctor of the sick child, he advised the speedy application of simple home remedies that would answer until he could get there. Soon as he could get out his horse and buggy and drive out, which took about an hour, he examined the child and says, 'you applied the remedies as I instructed you'; when I replied 'yes.' He then said, 'They have had the desired effect and I could not have done anything more had I been here then, but that has laid the foundation for what I shall now give and you may feel justly proud that you could communicate with me when you did, for in so doing you have saved the life of your child.' The physician lives on Washington street and arrived as soon as possible, but time is invaluable in such instances. Now any thoughtful person can understand the situation in cases like the above and see how valuable where the convenience of the telephone."

There is a widow and her daughter who live alone. The mother is subject to sudden attacks of sickness, which are so severe that the immediate need of a physician to save her life, has caused the daughter to have to leave her mother in the late hours of the night and go alone in the very worst of weather after the family physician.

Imagine the comfort of these ladies when they found the telephone would answer in their cases of emergency and serve as a signal in their hour of sickness and loneliness, to call for help.

Messages have been sent from Edgewood when life was at stake and not time for a messenger to come to the city on horseback. In one instance a message was sent for a physician, which he received only five minutes before a train started out on the Georgia railroad, and in ten minutes from that time he was at the bedside of the patient.

In another instance the physician wanted had no telephone and lived a mile from the residence of Mr. Jackson, assistant manager. The party telephoned him that as it was so early in the morning and there was no one he could telephone, he wanted to know if he would get word to the doctor. Mr. Jackson telephoned at once to a livery stable for a saddle horse to be sent him. By the time he was dressed the horse was at his gate; without losing a minute's time he mounted the horse, and in ten minutes time he was at the doctor's residence—in a very short time the doctor was in his buggy driving in haste to Edgewood. The distressed family were then telephoned that their message had been delivered and the physician was on the way there.

There is an attorney on Whitehall street, who did without the telephone for a long time. He finally subscribed for one, and afterwards said, "No argument could have convinced me of the value of the telephone. My experience has satisfied me that I made a mistake in not subscribing long before I did. I am never annoyed about the answers like I used to be when I sent my office boy." This gentleman has been using the telephone for two years and is still delighted with it.

There is a wholesale grocery merchant on Alabama street, who said not long since, "My telephone, which cost $60 a year, is worth a $75 per month salesman."

There is a wholesale tobacco and cigar store on Broad Street. The proprietor said when he paid his last bill: "I pay this more cheerfully than any other, for three-fourths of my trade comes over the telephone."

A retail grocer says: "I could not do more than half the business I now do without the telephone unless I were to double my force. The fact is, I could not get along without it. The ladies prefer to give their orders over the telephone than to have a man sent to the house for them."

There is a meat market firm on Peachtree who say one-half or two-thirds of our trade comes over the telephone. Would not be without it under any circumstances.

The Atlanta Compress company run two presses, have all their books kept at one office by the use of the telephone.

The Atlanta Cotton Seed Oil Mill Company do an extensive business at Kirkwood and have their office in the city.

Blount & Hill, at East Point, six miles from the city, where their factory is located, do an extensive business and are as easily consulted by telephone as when they did business here in the city.

The use of the telephone for all instances, as above mentioned, is worthy of consideration, and where the telephone has proven so valuable in cases of sickness and in business is correctly reported and the names of the parties referred to could be given if desired—does not this fully demonstrate the advantages of the telephone to all classes of business and make it essential to have in residences? There are many more advantages that could be mentioned, but we do not think it necessary. Volumes of evidence have been written to prove that Bell was not the inventor, but the evidences he produced have always been in his favor, and the courts of justice have repeatedly so decided—so we might write volumes on the use and advantages of the telephone, and still the subject would not be exhausted. And the actual use is enough to convince the public, and the large number in use all attest the facts as we have repeatedly stated. Business nor homes are not complete, nor can not be without the telephone. ATLANTA.

Death of Mr. H. P. Frost.

Herrick P. Frost, general manager of the Southern New England Telephone Company, died last Saturday in New Haven, after an illness of six months, from Bright's disease. Mr. Frost had been identified with the business interests of New Haven since 1856. In 1876 he retired from the wholesale grocery business and turned his attention to the telephone, in which field he became widely and popularly known. He and Geo. W. Coy, now of Milford, were the first to introduce the present system of telephone exchanges by means of the switch board. Finally the Southern New England Telephone Company was organized and Mr. Frost was selected as general manager. He was also a large stockholder in the electric light company. The deceased leaves a wife and three children.

The electrical fraternity has lost one of its most highly esteemed members in the death of Mr. Frost. He was a member of the Electric Club, of New York, and of the National Telephone Exchange Association, and in both organizations will be greatly missed.

The new dry battery, the work of Dr. Gassner, is meeting with pronounced favor, and is being widely introduced in this country by Mr. A. Schoverling, of New York.

The Hyde Park Electric Light and Power Company, at Chicago, was incorporated a few days ago, with $500,000 capital stock. L. S. Hills, Henry Decker, and Louis Bisbee are the incorporators.

Prof. F. B. Badt, the accomplished electrical engineer, has returned from an extended European trip, and will make his headquarters in future with the U. S. Electric Lighting Company, 120 Broadway.

Prof. Elisha Gray barely escaped being burned out of house and home on the first instant. About noon, a conflagration broke out in the N. W. Military Academy, at Highland Park, near Chicago. The flames spread with great rapidity, by reason of the high wind, the scarcity of fire apparatus and the limited water supply. Several buildings were ignited by blazing brands, and the professor's residence took fire several times, but was fortunately saved without damage.

Telephonic News

*** The St. Louis Electric Battery Supply Company has increased its capital stock from $2,500 to $50,000, and has secured a large warehouse at Second and Locust streets.

*** Talking from Buffalo to Boston over the telephone line, a distance of 810 miles, is a remarkable feat, The conversations are easily understood, and the lines are all working well, the result of the finest line construction in the world.

*** Mr. Amenzo Griffith, of Springfield, Mass., has patented a device for "ringing off" when a telephone user is through talking. It is so arranged that when the receiver is taken off the hooks a spring is wound up and this unwinding when the receiver is replaced gives a sharp turn to the magnet.

*** Mr. Geo. Herbert Wadsworth, of well-known carbon fame, is now devoting his ability and energy, of which he is well possessed, to advancing the cause of the Fisher Motor Company. This motor is winning quite a success on the Pacific Coast, after a long and hard battle with adverse circumstances. Mr. Wadsworth's headquarters are in Chicago, the Fisher motor being manufactured in Detroit.

*** The president of the Southern New England Telephone Company, Mr. Morris F. Tyler, was in Hartford Monday, and had a conference with Mr. A. C. Dunham, president of the Hartford Electric Light Company, in regard to the causes and the possible remedy of the present defective telephone service in the evening. The difficulty is not all with the electric light company. The conference resulted in a substantial agreement, and remedies will soon be found for the existing trouble.

*** The New England Telephone Company contemplates giving better service between Keene and Nashua, N. H., by taking off local instruments and giving a clean wire between those cities. At Nashua this wire will be so arranged that it can be connected with copper circuits running between Concord, Manchester, Lowell and Boston. The company proposes to extend the line which now terminates at Lowellville to Harrisville and Dublin. When this is done the instruments in Marlboro will be equipped with new call bells, which will be so arranged that all can be placed upon one wire over which there is to be no conversation attempted, while all the telephones and transmitters will be looped into another line as soon as the telephone is taken from the hook preparatory to talking. In this way the efficiency of the wire, it is reported, will be greatly improved, especially for carrying on conversation over long distances.

New Electric Apparatus by Partrick & Carter.

This well-known and reliable Philadelphia house has recently introduced two very useful and convenient electric attachments for the household. We illustrate both of them in this issue. In Figure 1 is shown the electric clamp attachment for the dining table, desk or other movable furniture. This attachment can be quickly put in position without defacing the furniture and can be used on top or underneath the table. This clamp and the combination foot-push, shown in Figure 2, makes a very complete and desirable dining table attachment. The advantages of the push are several. It can be used with or without the extension attachment, and the holes are made through so that no dust or dirt can possibly clog them. The cord can be attached to the fear-push, which can be held in the lap, or the clamp attachment underneath or on top the table.

And Now the Cushman Telephone Retires from the Field.

A celebrated telephone case, which has been in the federal court for some time, was decided last week by Judge Blodgett. The case is that of the American Bell Telephone Company against the Cushman Telephone Company. There were few persons in court at the time, only the lawyers interested in the case. The judge read the opinion as soon as court opened. It grants an injunction to the Bell Telephone Company against the Cushman Company. The opinion is as follows:

This is a motion for an injunction pendente lite by reason of the alleged infringement of patent No. 174,465 granted to Alexander Graham Bell March 7, 1876, and patent No. 186,787 granted to said Bell January 30, 1877.

The validity of the claims of these patents of which infringement is charged was sustained by the Supreme Court of the United States in what is known as the "telephone cases," decided at the October term, 1877, and reported at length in 126, United States Supreme Court reports.

Defendants admit that they use what is known as the Cushman telephones, and the telephones made by that company were held by this court to infringe the complainant's patent, and the claims now in controversy, in the case of the American Bell Telephone Company *vs.* The Cushman Telephone Company, decided in July last.

Defendants are engaged in furnishing telephone service and operating exchanges in several cities in Indiana and insist that an injunction should not be granted on this motion, because a few years since the complainant's grantees or licensees established telephone accommodations in some, if not all, of those cities, but withdrew therefrom after the passage by the legislature of Indiana of an act limiting the rates of charges for telephones and for telegraphic services.

I do not think the fact that the complainants, licensees, or grantees have withdrawn their telephonic accommodations from these cities furnishes any excuse or defense for the infringement of these patents by these defendants. The law gives the owner of a patent the exclusive right to the use of the device covered by his patent, and the rule that because the patentee or owner of a patent can not agree with those who wish to use his device as to the price to be paid for such use authorizes another to pirate upon the patent with impunity would be destructive of patent property.

Counsel for the defendants insist that the main question involved in this case is the validity of the Indiana statute regulating the charges of telephone service, but I do not consider that question involved in this motion. It was stated on the argument of this motion, and I doubt not truly, that this question is in the way to be presented at an early day to the Supreme Court of the United States, which is the proper tribunal to pass upon it. But it would be strange indeed if, where A is the undisputed or adjudged owner of a patent which B wishes to use, but B is not willing to pay the amount demanded by A for such use, therefore C can infringe the patent and supply B with infringing machines and not be restrained from so doing, when the validity of the patent and infringement are clear.

It was urged upon the argument that this court had decided in the former case of Hoe vs. Knapp that a patentee who did not put his patent into use was not entitled to an injunction, and that decision was invoked on the argument of this application for an injunction. I think, however, that the case there made was another and widely different one from this. There the patentee had never made a machine nor put his patent into use; he had simply locked it up, so to speak, and kept the public from the benefit of it. Here the patentee has put his patent into extensive use and is receiving a large income for such use at rates agreed upon between the owners of the patent and the users so that this complainant does not stand as the complainant did in the case cited.

An injunction will be granted according to the prayer of the bill.

"The decision prevents us from extending or operating our lines with the exception of the exchanges we have at Elkhart, South Bend, and Laporte, Ind.," said D. C. Boley, general manager of the Cushman company. "In these three towns we shall be allowed to operate our wires until Jan. 1, 1889."

We have received two very neatly gotten up pamphlets from the Van Depoele Electric Manufacturing Company, of Chicago. One of these illustrates and describes the company's arc light dynamos and lamps, current indicators, etc.; the other contains a very flattering list of letters printed in *fac-simile*, written to the Van Depoele Company heartily endorsing that system of electric lighting.

A Great Showing of Central Stations—Alternating System.

As an indication of the great advance made in the last two years by the alternating system, the following list of central stations of the Westinghouse Electric Company is published. When we consider how short a period it is since the alternating system was introduced into this country, this great showing becomes all the more wonderful. The list comprises central stations only, and does not include any isolated plants:

	LOCATION.	NO. OF 16 C. P. LAMPS.	OPERATING COMPANY.
1	Albany, N. Y	1,300	The Albany Electric Illuminating Co.
2	Allegheny City, Pa	1,300	Allegheny County Light Co.
	" " 1st increase,	1,300	" " "
	" " 2d "	2,500	" " "
	" " 3d "	2,500	" " "
3	Altoona, Pa	650	Mountain City Electric Light Co.
4	Aspen, Col	650	Roaring Fork Electric Light & Power Co.
5	Aurora, Ills	650	Aurora Electric Light & Power Co.
6	Austin, Tex	5,200	Austin Water, Light & Power Co.
7	Baltimore, Md	5,000	The Brush Electric Co., of Baltimore City, Md.
8	Bath, Me	650	Bath Electric Light & Power Co.
	" 1st increase,	650	" " "
9	Beaver Dam, Wis	650	Beaver Dam Electric Light Co.
	" 1st increase,	650	" " "
10	Bennington, Vt	650	Bennington Electric Light & Power Co.
11	Black Hawk, Col	400	Stearns, Roger & Co.
12	Braddock, Pa	650	Citizens Electric Light Co.
13	Buffalo, N. Y	650	Buffalo Electric Light & Power Co.
	" " 1st increase,	650	" " "
	" " 2d "	650	" " "
	" " 3d "	1,300	" " "
14	Buffalo, Wyo. Ter	650	Geo. T. Beck.
15	Carbondale, Pa	1,000	Electric Light, Heat & Power Co.
	" 1st increase,	300	" " "
16	Cedar Rapids, Ia	1,950	Cedar Rapids Electric Light & Power Co.
17	Charleston, W. Va	650	Kanawha Electric Light Co.
18	Chattanooga, Tenn	650	Chattanooga Electric Light Co.
	" " 1st increase,	1,300	" " "
19	Chicago, Ills	1,500	Consumers Electric Light Co.
20	Colorado Springs, Col	1,300	El Paso Electric Co.
	" 1st increase,	650	" "
21	Columbus, Ohio	2,600	Columbus Gas Light & Coke Co.
22	Conshohocken, Pa	650	Conshohocken Electric Light & Power Co.
	" 1st increase,	650	" " "
23	Cornwall, Ont	650	Stormont Electric Light & Power Co.
	" 1st increase,	650	" " "
24	Denver, Col	6,500	Denver Light, Heat & Power Co.
	" 1st increase,	1,300	" " "
25	Downington, Pa	400	H. D. McFarlan.
26	Duluth, Minn	1,300	Duluth Electric Light & Power Co.
27	Easton, Md	650	Easton Electric Light Co.
28	Eau Claire, Wis	650	Frank McDonough.
	" 1st increase,	650	"
29	Elizabeth, N. J	650	Elizabeth Electric Light, Heat & Power Co.
30	Englewood, Ills	750	Englewood Electric Light Co.
31	Evansville, Ind	1,300	Evansville Gas & Electric Light Co.
32	Flint, Mich	650	People's Electric Light & Power Co.
33	Fort Edward, N. Y	650	Ft. Edward Electric Light & Power Co., Limited.
34	Fort Worth, Tex	1,950	Ft. Worth Electric Light Co.
35	Gainesville, Tex	650	Gainesville Gas Co.
36	Galveston, Tex	650	Brush Electric Light & Power Co.
	" 1st increase,	650	" " "
37	Greensburg, Pa	600	The People's Electric Light Co.
38	Hagerstown, Md	1,300	Hagerstown Electric Co.
39	Halifax, N. S	650	Chandler Electric Light Co., Limited.
40	Hartford, Conn	650	Hartford Light & Power Co.
	" 1st increase,	650	" "
	" 2d "	1,300	" "
	" 3d "	650	" "
41	Hillsdale, Mich	650	Hillsdale Electric Light Co.
42	Hoboken, N. J	1,300	Hudson Electric Light Co.
43	Hoosac Falls, N. Y	1,300	Hoosac Falls Electric Light Co.
44	Hot Springs, Ark	650	Hot Springs Electric Light Co.
45	Houston, Tex	650	The Houston Electric Light & Power Co. of 1887.
46	Joliet, Ills	650	Joliet Electric Light Co.
47	Junction City, Kan	650	Junction City Electric Light Co.
48	Kingston, Ont	650	Kingston Electric Light Co., Limited.
49	Lincoln, Neb	1,950	Lincoln Electric Light Co.
50	Little Rock, Ark	650	Little Rock Electric Light Co.
51	Littleton, N. H	650	Littleton Water & Electric Light Co.
52	Mansfield, Ohio	650	Mansfield Electric Street Ry. Co.
53	Maquoketa, Iowa	400	Barnes Brothers.
	" 1st increase,	250	"
54	Marshall, Tex	650	Marshall Electric Light & Power Co.
55	Mendota, Ills	650	Mendota Electric Light Co.
56	Minneapolis, Minn	6,500	Minneapolis Electric Light Co.
57	Montgomery, Ala	1,300	Brush Electric Light & Power Co.
58	Morristown, N. J	650	Morristown Electric Light, Heat & Power Co.
	" 1st increase,	650	" " "
59	Nashville, Tenn	650	Nashville Light & Power Co.
	" 1st increase,	650	" " "
60	Newark, Ohio	650	Newark Electric Light & Power Co.
61	New Bedford, Mass	1,300	New Bedford Gas Light Co.
	" 1st increase,	650	" " "
	" 2d "	650	" " "
62	New London, Conn	1,300	New London Electric Light Co.
63	New Orleans, La	1,300	Louisiana Electric Light & Power Co.
	" 1st increase,	1,300	" " "
	" 2d "	2,600	" " "
	" 3d "	1,300	" " "
64	Norwich, N. Y	650	Norwich Electric Light & Power Co.
65	Oakland, Cal	1,300	Oakland Gas Light & Heat Co.
66	Olean, N. Y	650	Olean Electric Light & Power Co.
67	Oneonta, N. Y	650	Oneonta Electric Light & Power Co.
68	Ouray, Col	650	Ouray Electric Light & Power Co.
69	Paducah, Ky	400	Paducah Gas Light Co.
70	Palmer, Mass	650	Palmer Electric Co.
71	Parkersburg, W. Va	1,300	Parkersburg Electric Light & Power Co.
	" 1st increase,	650	" " "
72	Passaic, N. J	650	Passaic Electric Light, Heat & Power Co.
73	Peekskill, N. Y	1,300	Peekskill Electric Light & Power Co.
74	Philadelphia, Pa	1,950	Keystone Light & Power Co.
75	Pine Bluff, Ark	1,300	Pine Bluff Water & Electric Co.
76	Pittsfield, Mass	1,300	The Pittsfield Illuminating Co.
	" 1st increase,	650	" " "
	" 2d "	650	" " "
77	Pittsburgh, Pa	1,300	Allegheny County Light Co.
	" 1st increase,	1,300	" " "
	" 2d "	1,300	" " "
	" 3d "	1,300	" " "
	" 4th "	1,300	" " "
	" 5th "	1,300	" " "
	" 6th "	2,600	" " "
	" 7th "	2,600	" " "
	" 8th "	2,600	" " "
78	Pittsburgh, (East End)	5,200	East End Electric Light Co.
79	Pittston, Pa	1,300	Citizens Electric Illuminating Co.
80	Plainfield, N. J	2,600	The Plainfield Electric Light Co.
	" 1st increase,	1,300	" " "
81	Port Huron, Mich	650	Excelsior Electric Co., of Port Huron.
82	Port Jervis, N. Y	650	The Deer Park Electric Light Co.
83	Portland, Me	650	Consolidated Electric Light Co.
84	Pueblo, Col	1,300	The Pueblo Light, Heat & Power Co.
85	Red Cloud, Neb	650	Red Cloud Electric Light Co.
86	Richfield Springs, N. Y	650	Richfield Springs Electric Light & Power Co.
87	Richmond, Va	650	The Virginia Electric Light & Power Co.
	" 1st increase,	1,300	" " " " "
	" 2d "	5,000	" " " " "
88	Salem, Ohio	650	Salem Electric Light & Power Co.
	" 1st increase,	650	" " "
89	Salina, Kan	650	Salina Gas & Electric Light Co.
90	San Antonio, Tex	650	Electric Light & Power Co.
91	San Bernardino, Cal	1,300	The Electric Lt. & Power Co. of San Bernardino.
92	San Diego, Cal	1,300	Geo. D. Copeland.
93	Sandusky, Ohio	1,300	Sandusky Electric Light, Fuel-Gas & Supply Co.
94	Savannah, Ga	650	Brush Electric Light & Power Co.
	" 1st increase,	650	" " "
	" 2d "	650	" " "
	" 3d "	650	" " "
95	Schenectady, N. Y	2,600	Westinghouse Illuminating Co.
96	Seward, Neb	650	Seward Electric Light & Power Co.
97	Sheffield, Ala	650	Sheffield Electric Light Works.
98	Shreveport, La	650	The Shreveport Incandescent Electric Light Co.
99	Sing Sing, N. Y	1,300	Sing Sing Electric Light Co.
100	Sioux City, Iowa	650	Sioux City Electric Co.
101	Springfield, Mass	1,300	United Electric Light Co.
	" 1st increase,	650	" " "
102	Springfield, Ohio	1,950	Champion Electric Light Co.
103	Stapleton, N. Y	650	Richmond Light, Heat & Power Co., Limited.
	" 1st increase,	650	" " " " "

	LOCATION.	NO. of 16 C. P. LAMPS.	OPERATING COMPANY.
103	Stapleton, N. Y.	2d increase, 650	Richmond Light, Heat & Power Co., Limited.
	" "	3d " 1,300	" " " " "
	" "	4th " 1,300	" " " " "
104	Steubenville, Ohio	650	Electric Light & Power Co.
	" "	1st increase, 1,300	" " "
105	Stillwater, Minn	650	Stillwater Gas & Electric Light Co.
106	St. Cloud, Minn	650	The St. Cloud Gas & Electric Co.
107	St. Louis, Mo.	2,600	The Metropolitan Electric Co.
108	St. Paul, Minn	2,600	St. Paul Gas Light Co.
109	Tampa, Fla	650	Tampa Electric Light & Power Co.
110	Torrington, Conn	650	The Torrington Electric Light Co.
	" "	1st increase, 650	" "
111	Trenton, N. J	3,250	Peoples Electric Light Co.
112	Troy, N. Y	1,300	Troy Electric Light Co.
113	Tyler, Tex	650	Tyler Electric Light Co.
114	Tyrone, Pa	650	Home Electric Light & Steam Heating Co.
	" "	1st increase, 650	" " "
115	Weyers Cave, Va	650	The Grottoes of the Shenandoah.
116	Wheeling, W. Va	650	The Wheeling Electrical Co.
	" "	1st increase, 650	" "
	" "	2d " 650	" " "
117	York, Pa	650	York Electric Co.
118	Providence, R. I.	2,000	Narragansett Electric Lighting Co.
119	Beaver Falls, Pa.	650	W. H. Hartman.

Total number of stations, 119.
Total generating capacity on 16 c. p. lamp basis, 201,750.
Total generating capacity on 10 c. p. lamp basis, 318,560.
October 15th, 1888.

The Telegraph for Military Purposes.

The subject of Government telegraph lines forms an interesting chapter in Gen. Greely's annual report, just submitted to the War Department. We publish this portion of his report in full: The telegraph room of the central office has been conducted with the same efficiency as has characterized it in past years, and all work has been most satisfactorily and promptly done. In addition to the receipt of more than a million words of cipher reports, and the transmission of about 80,000 service telegrams, the men of this room have also been charged with auditing the large and intricate telegraph bills connected with the work of this service. Judging from the grave misstatements publicly made, regarding military telegraph lines operated by this service, there must be a misapprehension as to their location, use and extent. This service has built in the past 14 years about 8,250 miles of military telegraph lines, which fortunately the rapid advance of settlement and civilization has reduced to less than 2,000 miles.

THE GOVERNMENT TELEGRAPH LINES

operated by the service are of two classes: 1st. The military lines proper, maintained for military purposes only, but which also transact such commercial business as may offer. 2d. The seacoast lines, which are of no value so far as any military necessity now existing is concerned, but which are of great value to maritime interests and to residents and visitors at or near the points through which these lines are built. There are in existence at this time 1,905 miles of telegraph lines which are used for strictly military purposes, and in connection with which four officers, forty-six enlisted men, and thirty-three civilians of this corps are now serving. These are frontier telegraph lines, used for facilitating military operations in the Indian country through which they pass, and insuring safety to the settlers by their presence. It has been alleged that these lines are for meteorological purposes, and they have been even credited with doing an amount of weather telegraphing equal to that of all the commercial lines of the country. The weather observations made at the offices of the military telegraph lines are simply incident to the service, and if the entire 1,905 miles of lines were abandoned to-day the efficiency of the general weather service would be in no wise impaired. The $24,000 charged against the weather bureau for the operation and maintenance of these lines is in reality a part of ordinary Army expenses for military purposes, the execution of which devolves, by the strict terms of the act of Congress, June 23, 1874, on the Chief Signal Officer of the Army.

The value of most of these lines, from a military standpoint, cannot be questioned. It is apparent to every soldier that Arizona and New Mexico could not be efficiently protected against Indian outbreaks without the greater part of these military lines, and the value of the Rio Grande line, in avoiding serious complications on the Mexican frontier, has been set forth by the experiences of the past month. These lines transact for settlers such commercial business as is presented, and the receipts from this source, aggregating for the past year $4,172.84, have been turned into the Treasury. The aggregate expenditures, including salaries of officers and men of the Signal Corps, amounts to $66,700, exclusive of assistance given by the use of army teams and labor, which if hired in open market would have cost about $20,000 more.

In the Department of Dakota containing 382 miles of line, the Government sold during the year 135 between Glendine and Poplar River. There are in the Department of the Missouri 239 miles; 7 miles were built from Miami to Fort Elliott, and 90 miles were sold from Fort Supply to Fort Elliott. There were no changes in the Departments of Texas and California, the former containing 124 miles and the latter 12 miles. The Department of the Columbia contains 253 miles. During the year 30 miles were sold from Fort Spokane to Spokane Falls. The Department of Arizona contains a greater length of line than any other, its figure being 540. The line from Pœnix to Maricopa, 30 miles, was sold, and also 7 miles at Fort Huachuca. There are 375 miles in the Department of the Platte, which contained the greatest number of changes. The line from Fort Robinson to Crawford, 3 miles, was abandoned. A line 87 miles in length was built from Fort Du Chesne to Prince Station. The line from Fort McKinney to Powder Station, 51 miles, was transferred from the Quartermaster's Department of the Army. The service leased and repaired 152 miles of line from Rawlins to Fort Washakie.

A COSTLY SECTION.

The line from Poplar River to Fort Maginnis, in the Department of Dakota, 232 miles in length, is the most costly of all the telegraph lines connected with this service. The intervening country is wild and desolate in the extreme, and generally without inhabitants, so that at Galpin, the repair station, this service is obliged to maintain, at an expense of $1,630 per year, two civilian repairman, since one will not live there alone. The total receipts from the line during the past year were $155.17, while the cost to the Government for maintaining and operating the section is over $4,000 annually.

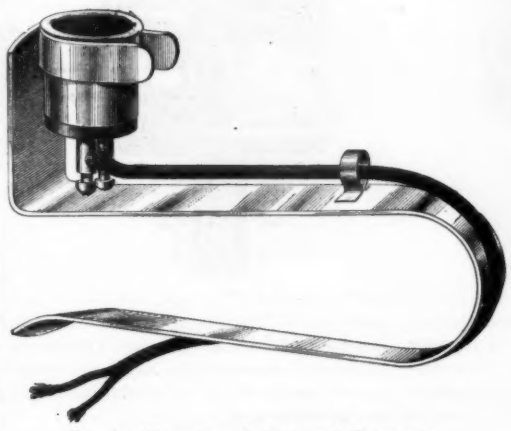


FIG. 1.—PARTRICK & CARTER'S ELECTRIC CLAMP ATTACHMENT.

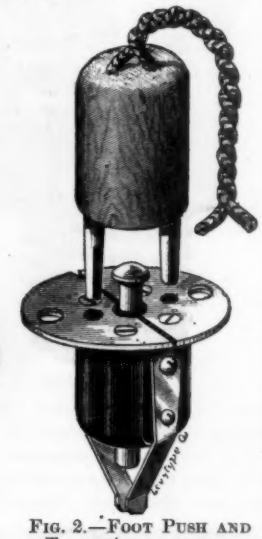


FIG. 2.—FOOT PUSH AND TABLE ATTACHMENT.

The Chief Signal Officer continues the policy of abandoning and selling military telegraph lines whenever the advance of railways or the extension of the general telegraph system affords the Government an opportunity of reaching military stations over a private wire. No lines are extended nor are any general repairs made without the recommendations of the commanding general of the Army to the effect that such expenditures are necessary for military purposes.

SEA-COAST TELEGRAPH LINES.

There were in operation at the end of the fiscal year 561 miles of sea-coast telegraph lines. The only line constructed during the year was built under the act approved February 17, 1887, and extends from Titusville, Fla., to Jupiter, Fla., 180 miles. This line connects the life-saving and light-house stations at Jupiter with Titusville, and is used to report all vessels passing near the station. The construction of the line cost $16,117.59; its annual expense for operation and maintenance will be between $6,000 and $7,000, and the receipts $600.

The section between Wilmington and Southport, N. C., is valuable to shipping interests, owing to the facilities it offers for storm warnings and the reporting of vessels. The annual cost of maintenance and operation is about $1,000, and the income about $90. The Hatteras section, from Hatteras Inlet, via Cape Henry, to Cape Charles by cable, and Norfolk by line, was formerly of very great value. There has been no year in which life and property have not been saved on the North Carolina coasts by the operation of this line. Within the present year the British steamer Kimberly stranded near Wash-Woods, and through the prompt call of the Signal Corps operator the crew, cargo and steamer were saved. The vessel and cargo were valued at $500,000. The march of invention, and the extension of the Life-Saving Service render it practicable for the surfmen to operate this line with telephone apparatus, as is now done along the New Jersey, Delaware and Virginia coasts. Such a course would prevent the duplication of a Government paid force and relieve this service from the annual expenditure of $8,000, which the present manning of this line by experienced operators entails. The receipts from the line barely amount to a dollar a day.

This line from Narragansett Pier to Block Island had cost the Government about $55,000 in the past eight years, exclusive of the annual expenses, which aggregate about $4,000, against an annual income of $400. The line is of value to Block Island and, incidentally, to shipping interests.

AN IMPORTANT SERVICE.

The most important and valuable line on the Atlantic coast is the telegraph system connecting Nantucket and Martha's Vineyard with Wood's Holl, which has cost the Government about $50,000, apart from the annual expense of maintenance, which is about $6,000; the income is about $1,000 annually. These lines furnish communication to about 7,000 people throughout the year, and to about 40,000 during the summer months. The most important uses of the lines, however, are for the display of storm signals for the benefit of the 60,000 vessels which annually pass Gay Head, and the summoning of assistance for scores of vessels in distress. The ice blockade of January, 1888, caught over 50 vessels in the ice within sight of Nantucket. If it had not been for this system of cables, by which powerful tugs and revenue cutters were summoned from all quarters, there would have been serious losses of life and property. It is believed that in this single instance, apart from human life preserved, the original cost of land lines and cables was equalled by the value of the property saved.

The sea-coast service is represented on the Pacific Coast by the Cape Flattery and Fort Canby cables. These lines are valuable for the reporting of vessels and the summoning of assistance in cases of distress. They cost this service $8,000 annually, while the income is substantially nothing, being less than $50 a year. The new Point Reyes telegraph will be a third line of the same character, and for the same purpose, although the annual cost of maintenance and operation will probably not exceed $1,000.

The very great expense of these sea-coast lines has unduly weighed down the appropriations of the Weather Service in past years, and, in view of this fact, the Chief Signal Officer has deemed it important that he should clearly set forth that over $100,000 of his appropriations are chargeable against sea-coast and military telegraph lines which are only of slight and incidental value to the general weather system of the country. There is no intention of ignoring the fact that the reporting of vessels and the summoning of assistance in case of maritime disasters are services of inestimable value which the General Government should render, but the object and character of the work should be clearly set forth, so that distinctive and necessary appropriation may be made therefor.

—— The report of the Special Public Lighting Committee of the Detroit Board of Aldermen, which includes the detailed report prepared by Mr. Fred. H. Whipple, has been printed in pamphlet form.

TELEGRAPHIC

.... An inventive mechanic, of Bridgeport, Conn., is said to have perfected a locomotive attachment which utilizes the phonograph in a new way. By means of a device every blast of the engine's whistle is recorded, together with the exact time at which it occurs. This will, it is predicted, be of great value to railroad companies in protecting them from the false pretensions of persons who are injured or mutilated while on the track.

Phonographing an Opera.

[From the New York *Sun*.]

As soon as an opera is produced with any degree of success, especially one by Gilbert and Sullivan, the horseshoe-scarf-pin managers of the never-pay-royalty companies fly to New York and by some trick or device steal the work, and in less than a week they astonish our rural cousins with the latest New York and London success. It is customary for some music publishing firm to arrange with the authors or controllers of successful operas for the publication of a libretto and piano score, and by doing so they make it comparatively easy for any one to perform the opera, but in the case of "The Yeomen of the Guard" the libretto only was published, consequently the piratical companies could do nothing with the opera.

The average small opera manager is as full of expedients as an egg is of meat, and generally finds some way out of a dilemma, especially if a sheriff is the dilemma; but the latest trick, as performed at the Casino last night, is both unique and interesting. Yesterday afternoon Mr. Pollock, the treasurer of the Casino, received a telegram asking that a box be reserved for a Mr. Frank Wilber. One of the lower boxes was reserved, and at eight o'clock last evening a commercial looking man entered the lobby hurriedly called for the box, paid the necessary amount and was ushered in.

Noticing that the gentleman had a large telescope valise, Mr. Daly the usher, asked if he should take it to the check room for him, but the gentleman declined to have it checked giving as an excuse that the case contained jewelry, and he preferred to have it remain with him. Very little attention was given to the lone man in the box, and had it not been for the watchfulness of Mr. Daly it is probable that the man and his trickery would have escaped detection. The house was packed to suffocation, and when the finale of the first act was begun Mr. Daly opened some windows in the lobby to give the audience a little fresh air.

As he turned from the windows his eye lighted upon a queer-looking machine lying on a chair near the lone man. Daly's first thought was of dynamite and anarchy; his next of how to remove the disciple of Herr Most and his death dealing machine; his next thought—but before he thought again he had planted the man and his machine in a chair in Mr. Rudolph Aronson's office, and was standing at a respectful distance from him waiting for either the machine to explode or the man to begin a harangue.

In the office at the time were quite a party of gentlemen chatting with Mr. Aronson, among them being Col. Stark, Dr. Nesbit and Albert Aronson, but they very quickly sought other quarters when Mr. Daly and his charge entered so hurriedly. Mr. Aronson, with his usual coolness and presence of mind, remained seated and awaited developments. The mysterious stranger opened the conversation by saying:

"Well, I guess I'm done for. I suppose you want to know who I am and what I'm doing here. I manage a small opera company, and I desired to include 'The Yeomen of the Guard' in my repertoire. I could not obtain the music so I concluded to come here to-night and take it down by the aid of a phonograph. If your precious usher had not been so inquisitive, I'd have had the whole blooming opera, but I only got the first act."

He turned the crank of the mysterious box, and it emitted the music of the opera as clearly and distinctly as though the artists and an orchestra were performing it. Mr. Aronson confiscated all the cylinders, and told Wilber to go, which he did very quickly.

The San Jose, Cal., supervisors have granted a six months' extension of time for the completion of the electric railroad to Santa Clara.

Several storage battery cars are being run on the Fourth Avenue line by the Julien Electric Traction Company. These cars are always crowded and are the popular ones of the line.

The extension of the Ithaca Electric Railway to the E. C. & N. Depot, a distance of about two miles, is being talked of. A hill of very heavy grade will have to be mounted, which is a serious obstacle, a center wheel will doubtless be necessary. The Daft system is used.

The cars for the Sacramento, Cal., electric road have been shipped from Philadelphia. Three miles and a half of road is in running order. The Sacramento Electric Light Company will furnish power to charge the batteries in the cars. This will be the first electric road on this coast run by storage batteries in the cars.

The Julien Electric Company, of New York, have recently sold to the Hartford Electric Light Company, for central station purposes, 500 of their large type of accumulators, which are for the purpose of supplementing the direct lighting plant of the Hartford Co. They have also sold for traction purposes some 700 cells, and have obtained the contract for the installation of a plant in the Brooks Locomotive Works, Dunkirk, N. Y.

The Sprague electric road at Akron, Ohio, which has now been in operation for about three weeks, has been running very successfully and has been carrying a large number of passengers. There are now 12 cars in operation, and these have been giving such good satisfaction that the management are understood to be considering the advisability of increasing this number. A great many people, who ordinarily do not use the street railway cars, have been riding upon the electrical cars, being curious to try the new motive power.

Mr. Geo. A. Redman, the well-known electric light man of Rochester, N. Y., recently delivered an interesting address before the Rochester Academy of Science on "Electric Light and Power." A one-horse power Brush motor and a one-eighth horse power C. and C. motor were used by the speaker in illustrating his remarks. The latter motor operating a sewing machine. At the close of his address Mr. Redman answered a number of questions relating to the subject, which had suggested themselves to his hearers.

New Applications of Motors.

Since the last issue of the REVIEW, the New England agents of the Sprague Electric Railway & Motor Company, of New York, have installed two motors in mills in Massachusetts for new applications. One of these is at the Wamsutta Mills in New Bedford, where the motor will be used for hoisting purposes, and will be run off of the Edison incandescent lighting plant which is used for lighting the mills. The other motor is in use at the Laurel Lake Mills, Fall River, where the motor is also run off of the lighting circuit and is used for operating slashes.

The advantages of using electrical power in mills are manifold. Among them may be mentioned the ability to transmit power economically and efficiently to points not otherwise accessible, the ability to transmit power by a conductor at once cold, immovable and easily bent, and a great reduction in insurance rates.

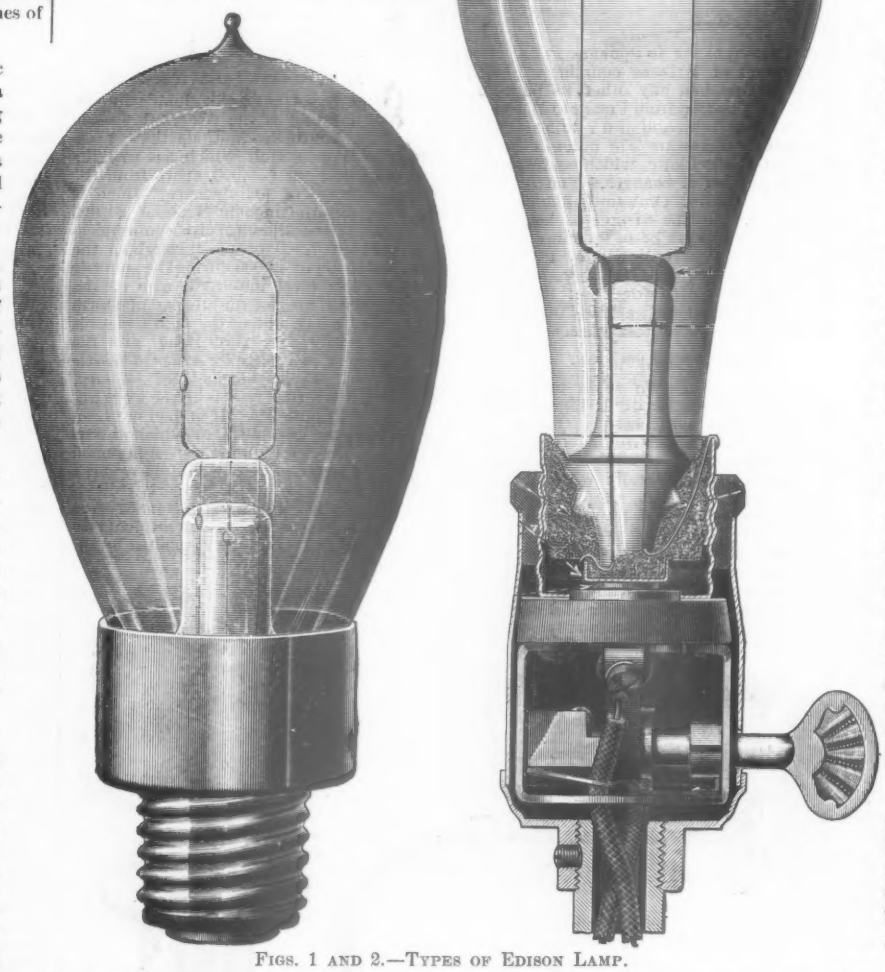
In both of these cases the agents of the mills express themselves as being very well pleased with the operation of the Sprague motors.

A Lamp That Has Come to Stay.

The extreme long life of an incandescent lamp is always of interest to electricians. The Bigelow Carpet Company, of Clinton Mass., have had a Swan incandescent lamp burning from a Brush dynamo in their dynamo room for 7,400 hours. To all appearances the lamp is yet good for service for a considerable length of time. It is not blackened in any way. It has been presented to the Brush Electric Company, of Cleveland, O., as a curiosity, and is now burning in their general offices in Cleveland.

Fishing by Electric Light.

"There are fishermen on the coast of Maine who are now fishing by electric lights." A Fulton market fish dealer was talking about his business to a reporter. "This is not a new departure," he continued, "but new ways of utilizing the lights have been discovered. The old way was to plunge an incandescent lamp into the water, the connection being made with some source of electricity on board the fishing vessel. When this was used in deep-sea fishing it was found that the mains to the lamp often got foul of the fishing tackle, or the cable of the vessel, thereby destroying its usefulness. A Frenchman has surmounted the difficulty by adopting a lamp worked by a primary battery, the whole of which can be thrown overboard and regained when the trip is ended. The battery consists of six Bunsen cells, in which, however, chromic acid is placed instead of nitric acid, formerly used. The cells are connected in tension with a 12 volt Edison lamp. The success of the experiments lately had presages the general adoption by our coast fishermen of this new discovery."



FIGS. 1 AND 2.—TYPES OF EDISON LAMP.

FIG. 3.—PRESSURE INDICATOR.

FIG. 4.—AMPERE METER.

—— The Erie Telephone Co.'s directors have declared a dividend of ¾ of 1 per cent. and an "extra" dividend of ¼ of 1 per cent., both payable November 15th, to stockholders of record November 5. The gross earnings of the company for the quarter ending Sept. 30th, 1888, were $168,360; expenses $109,053; net, $59,307; taking out $36,360 for the dividend just declared and $8,846 for construction, and there remains a surplus of $14,460.

The Edison System in New York.

The Edison Illuminating Company, of New York, has now under course of construction three large central stations for supplying the electric current to the principal business and residence districts of this city. Each of these new stations will have a capacity of 50,000 lamps. The original incandescent central station was built and successfully started in New York, and is considered by Mr. Edison—as well it may be—the greatest work of his life, for there he had no experience to guide, no tried methods to adopt, no apparatus that had been proven. The station commenced to operate September 4th, 1882, and has run every hour since—a notable and valuable record. Now with its past experience to aid it, the Edison Company, with an increase of its capitalization from $1,000,000 to $2,500,000, is putting in such electric work in New York City as will in magnitude and perfection excel all its former efforts.

When these stations are completed and the company begins to supply the consumer we predict he will be found to be numerous and urgent, for the New Yorker is always desirous of improvement, and what more decided improvement and agreeable change can there be than from the air-vitiating gas to the soft and beautiful Edison incandescent lamp?

The Edison Company announces that they have laid nearly 50 miles of underground conductors, having a capacity of 100,000 lamps, for connection with these new stations. The underground system of the Edison Company has been in practical use for over six years, and consists of copper rods enclosed in heavy wrought iron tubes, special provision being made for perfect electrical connections throughout. All electrical connections between sections are made by means of flexible copper cables and are enclosed in cast-iron boxes fastened to the tubes and filled with an insulating compound.

The system is based upon the principle of "sectional construction," the line being made in sections each complete in itself and the work of construction in the trench consists merely in joining the completed sections together.

In a line so constructed, the rods and jointed sections become continuous conductors heavily encased in iron and completely surrounded by a tough, adhesive, elastic and waterproof insulating compound. This complete filling of all interstices with solid insulation is made possible by the method of manufacturing in short sections; while, from the comparative frequency of the joints so necessitated, and the method of making them, a set of service wires for any building in the district covered by the conductors may be readily and conveniently connected. The external diameter of the largest tubes will be about three inches, and of the smallest tubes about one inch. The connections are made at man-holes, or junction boxes, one of which we illustrate as well as several of the joints.

In a catalogue recently issued by the Edison Company, attention is justly called to the difference between producing an electric "light" and producing a "system" of electric lighting. This company, no one will dispute, through the efforts and genius of Mr. Edison has perfected a complete electric lighting system, and one that has been tried for years and proven successful. Several of the details that go to make up the Edison system, are presented in this issue as deserving of this special prominence in view of the vast work soon to be completed in New York, where we doubt not the new central station of the Edison Company will prove to be one of the finest in any city or country in the world.

NEW ENGLAND NOTES.

The Waterhouse Electric and Manufacturing Company, of Hartford, Ct., has just been awarded three medals at Cincinnati, one gold and two silver ones. This is the second gold medal which the company has received during the year.

The East Side, Brockton, Mass., electric street cars were given a trial Tuesday, and were run steadily from 8 o'clock until nearly midnight. Electrician Tucker had charge of the horseless conveyances, and a number of East Side directors enjoyed the ride. The cars ran finely, being very smooth and easy in motion. Crescent street was the only street traversed. The cars were run at varying speeds, and at one time one was let go at the rate, as one of the passengers said, of nearly 20 miles an hour. Brilliantly lighted with five 16 candle electrics, a car presented a pretty appearance as it glided over the rails. No difficulty was experienced in sending a car evenly and at good speed on the up grades, and everything was generally joyous and prophetic of great success in the near future. It will not be long before these pretty coaches of the plebeians will be navigating the eastern part of the city. The following evening all the cars were running, and Mr. F. J. Sprague, whose system is used, was one of the passengers.

The Mather Electric Company has replaced a storage plant in Waltham with its system.

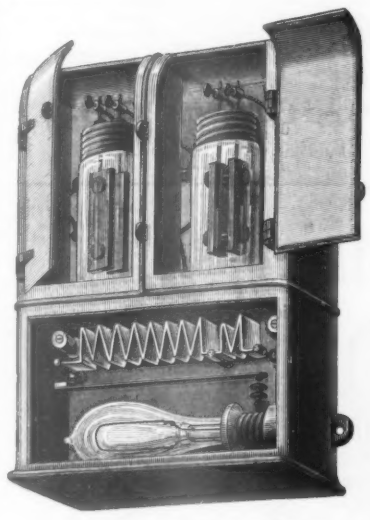


FIG. 5.—THE EDISON METER.

Whitman, Mass., has held a town meeting to consider the subject of an electric lighting system. The business men of that live community regard such a plant as a good investment, and all the town will be asked to do is to agree to use the lights in place of the present lamps. Of course Whitman will vote for it. No wide-awake town can afford to live in Egyptian darkness these days.

The selectmen of Medford have voted to close a contract with the Malden Electric Light Company for 200 incandescent lights and 20 arc lights, the latter and 40 of the incandescent lights to be furnished immediately, and the balance of the 200 incandescent lights to be furnished before spring. All the other lighting in town is to be by oil lamps furnished by the same company, and the whole system of lighting to be furnished at the rate of $7,000 per year for a term of three years.

The Methodist Church, Attleboro', is lighted by incandescent lights.

The new building which the Pittsfield Illuminating Co. are building at Merrill's, will be about 20x32 feet and is already nearly completed. It stands in the rear of their shop and will be practically fire-proof. When completed the new engine and three large dynamos will be placed therein.

The Edison electric light men have taken up the conduit, laid on Thames street from Washington square south, Newport, R. I., the highway committee having forbidden the laying, and will run their wires overhead. So, while the governments of other cities are doing all they can to get the electric wires underground, the Newport city government has done enough to effectually prevent such disposal of wires, in the place most desired, on Thames street.

The incandescent lights in the Huntington Street Baptist Church, New London, are giving good satisfaction, and now the South Congregational Church, of Bridgeport, is to adopt electric illumination. Thus in its march of progress does electricity aid in the religious work of the time.

Bucksport, Me., citizens are taking kindly to incandescent illumination and there is a large demand for lights.

The officers of the Woonsocket Street Railway Co., have been inspecting the Daft system of electric roads now in successful operation at Meriden, Ct.

The new electric lights erected on the hospital grounds at Augusta, were used for the first time Sunday night. There are eight of them about the institution, and it is expected that the interior halls will be so nicely illuminated by them that the watchman on making his rounds, will not require any additional light.

A new dynamo is about to be put in at South Paris, Maine, for the purpose of enlarging the electric light facilities.

Saco, Me., is to have a new incandescent plant.

A sharp controversy is being carried on between the Danbury, Ct., merchants and the Danbury and Bethel Gas and Electric Light Co., which recently advanced the rates on electric lights. Unless the old rates are restored, the merchants have agreed to discontinue the use of the lights.

Cochituate, Mass., merchants want the electric light.

The Pawtucket Common Council have passed the ordinance relating to municipal lighting, over the Mayor's veto.

Athol, Mass., citizens fear that the consolidation of the gas and electric light companies in their town will prevent the introduction of incandescent lights for some time.

Fifty-eight Baxter motors are now running in Boston, thanks to the efforts of Mr. Frank Ridlon and Messrs. Lean and Rand.

Mr. West, treasurer of the Kennebec Light & Heat Co., was a Boston visitor last week. He has been in consultation with the local Baxter motor agency and has arranged for the addition of a large number of electric lights and motors to his present plant.

The closing of the following contracts has kept Mr. C. S. Haley, the Brush Co.'s special agent, occupied during the past week or two. The Kennebec Light and Heat Co., have contracted for a 1,200 c. p. 45 lighter for Augusta, Me., and a similar plant for Hallowell, just down the river, both of the Brush system. The Taunton, Mass., Electric Light Co., has concluded to make its entire plant of the Brush system, and has closed a contract for a similar 45 light machine.

The Gilman Indicator for office buildings, which was illustrated in the REVIEW, is being put in the building 178 Devonshire street, Boston, where the Gilman Co. has its offices.

A recent visit to the extensive works of the Billings & Spencer Drop Forging Co., at Hartford, showed how enormously their business has increased from its earliest beginnings to the present time. Among the company's customers are found nearly all the the prominent electric light concerns in the country, and the interesting sample boards show copper and steel forgings for these, as well as for representatives of almost every other known industry. T. W. S.

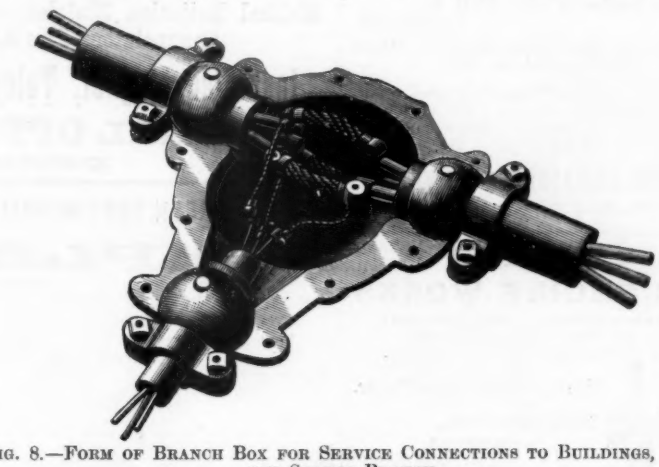


FIG. 8.—FORM OF BRANCH BOX FOR SERVICE CONNECTIONS TO BUILDINGS, ALSO FOR STREET BRANCH.

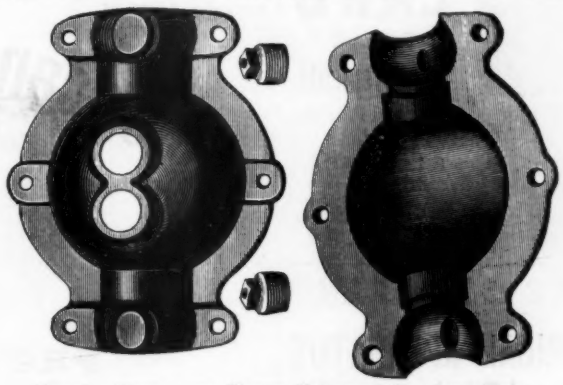


FIG. 7.—UPPER AND UNDER PARTS OF JUNCTION BOX.

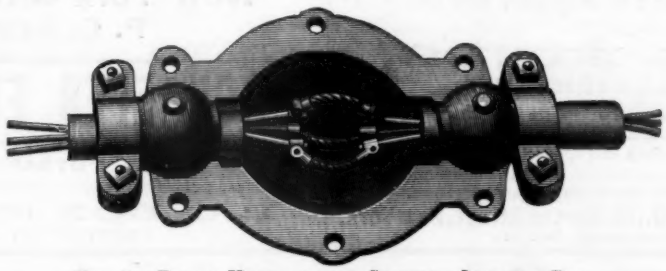


FIG. 6.—EDISON UNDERGROUND SYSTEM.—JUNCTION BOX.

—— The Petaluma, Cal., woolen mills were lighted last week with electricity.

ELECTRIC LIGHT NEWS

—— The Phosphor-Bronze Smelting Co., Limited, of Philadelphia, has issued its October price list.

—— Electric lights have been placed in every business room in the Read house block, Chattanooga, Tenn.

—— At Manchester, N. H., a new contract has just been made and electric lights will burn from sunset to sunrise.

—— The Thomson-Houston electric light plant in the Hughes' hotel, Fresno, Cal., is completed. There are 554 incandescent lamps.

—— There is quite a fight in Allegheny, Pa., over the electric lighting contract for the city, with chances in favor of the Ft. Wayne Jenney.

—— Hansey & Glenn, of Dalles, Ore., have purchased a 35 light dynamo and lamps from the Thomson-Houston Company, through the Portland agency.

—— The Paducah Gas Light Company, of Paducah, Ky., have recently enlarged their arc light plant somewhat by adding a number of Brush lamps thereto.

—— A complete alternating incandescent system is soon to be put in operation at Cornell University. A gift of the Westinghouse Electric Co., of Pittsburg, Pa.

—— The Thomas Phillips Paper Co., of Troy, N. Y., are about to put in a 40 light electric illuminating plant with which to light their mill on West Exchange street.

—— The Thomson-Houston Electrical Company have recently very generously presented two of their dynamos to the Electrical Engineering Department of Cornell University.

—— The Dorsett conduit is being put down in Minneapolis, Minn. The city council, after several attempts, has adopted a resolution requiring all the wires to go under ground before Nov. 1, 1889.

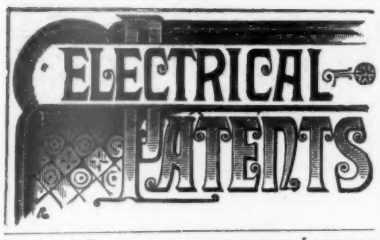
—— Says the Boston *Commercial Bulletin*: "Electric light and power stocks are attracting much attention, and many shrewd investors think there is more money in them than in many other properties on the market."

—— The Edison Electric Light and Power Company of Erie, Pa., have added several Thomson-Houston dynamos, and will supply arc lights in addition to the Edison Incandescent. The Ball engine is used for this new work. Other incandescent dynamos will be added, increasing the lighting capacity in this respect over 50 per cent.

—— The Faraday Carbon Co., of Pittsburgh, is taking advantage of the situation caused by a severe fire and is enlarging its capacity, and by the time this is read will be in position to fill orders—of which it has a constantly increasing supply—more rapidly than before. The company deserves to be complimented over the promptness with which it recovered from the damage caused by the fire last week.

—— The Newburg theatre at Vienna is the best illuminated place of amusement in the world. There are 5,000 incandescent lights within the house, besides the great arc lights outside. All over the theatre are distributed in small intervals red lanterns holding wax candles which are long enough to last through the evening, and which are sufficient to give light in case the electric light should by any chance be extinguished.

Elizabeth, N. J.—The New Jersey Light and Heat Company; Capital stock, $125,000. De Witt Stearns, Des Moines, Iowa, and others incorporators.



INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING OCTOBER 30, 1888.

391,783 Automatic electric heat regulator; William A. Connelly, Boston, assignor of one-half to John Buckley, South Boston, Mass.

391,792 Electric railway; 391,793 Motor car for electric railways; Isaac W. Heysinger, Philadelphia, Pa.

391,797 Electric motor; Walter E. Hyer, Newburg, N. Y.

391,815 Manufacture of incandescent lamp filaments; 391,816 Flashing apparatus for carbon filaments; James W. Packard, New York, N. Y.

391,831 Signaling attachment for weighing scales; Edward H. Amet, Chicago, Ills.; assignor to himself and Herbert A. Streeter, same place.

391,839 Individual signaling apparatus for telephones; Edward Davis, Boston, assignor of one-half to E. B. Welch, Cambridge, Mass.

391,853 Cut-out for electric circuits; Henry C. McDill, Fort Worth, Texas.

391,855 Circuit-closing mechanism; Charles E. Ongley, New York, N. Y.

391,917 Detachable circuit-closing device for electric bells and annunciators; James D. Randall, Memphis, Tenn., assignor of one-half to George Schmalzried, Jr., same place.

391,923 System and apparatus for electrical distribution; Marmaduke M. M. Slattery, Woburn, Mass.

391,943 Electric switch or cut-out; Waldo C. Bryant, Waterbury, Ct.

391,954 Regular for dynamo-electric machines; Stephen D. Field, Yonkers, N. Y.

391,969 Electric self-winding clock; Vitalio Himmer, New York, N. Y.

392,018 Electrical measuring instrument; Victor H. Emerson, New York, N. Y., assignor of one-half to Herbert F. Seip, Easton, Pa.

392,033 Telephony; William W. Jacques, Newton, Mass.

392,034 Electrical switch; Orville B. Johnson, St. Johnsbury, Vt.

392,069 Machine for making conduits; George Richardson, Boston, Mass., assignor to the American Conduit and Construction Company, Portland, Me.

392,080 Electrode for secondary batteries; George H. Stout, New York, N. Y.

392,090 Electric distribution by alternating currents; Carl Zipernowsky, Buda Pesth; Maximilian Deri, Vienna, and Otto T. Blathy, Buda Pesth, Austria-Hungary.

392,103 Electric conductor; Henry F. Campbell, Concord, N. H.

392,114 Apparatus for electrical distribution; George B. Fraley, San Francisco, Cal.

392,127 Insulator for electrical conductors; John C. Love, Philadelphia, Pa.

392,158 Method of connecting filaments to leading-in wires; 392,159 Apparatus for mounting filaments of incandescent lamps; Hermann Lemp, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut.

392,167 Automatic electric switch; Isaiah L. Roberts, Brooklyn, assignor to the Roberts Brevoort Electric Company, Limited, New York, N. Y.

CONDENSERS WM. MARSHALL, MANUFACTURER. Standards a Specialty
Rooms 2 and 4, University Building, New York.

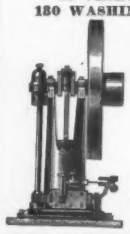
SPLICER requires engagement. 20 years experience in cable work, lead covered included.
L, 271 W. 40th Street.
NEW YORK CITY.

FOR SALE.

1 Buckeye Engine, 17"x30", 180 H. P., 1½ years old.
1 N. Y. Safety Engine, 13"x12", 90 H. P., 2 years old.
1 N. Y. Safety Engine, 12"x12", 60 H. P., 6 years old.
5 Ball Engines, 10"x12", 60 H. P., 4 years old.
1 Westinghouse Engine, 9"x9", 50 H. P., 4 years old.
1 Payne Engine, 8"x10", 35 H. P., 5 years old.
Also Boilers, Berryman Heaters, Steam Pumps, Valves, etc.

The above apparatus are all in good condition and require no repairs. The stations in which they were operated have been closed. For further particulars, prices, etc., apply to
CHICAGO ARC LIGHT & POWER CO.
76 Market Street, Chicago.

OTTO GAS ENGINE WORKS
83d AND WALNUT ST., PHILADELPHIA.
18 VESEY STREET, NEW YORK.
180 WASHINGTON STREET, CHICAGO.



Sizes, 1 to 100 Horse Power.
HORIZONTAL, VERTICAL, TWIN, CYLINDER.
We will contract to furnish Incandescent or Arc Electric Light Plants, with "Otto" Engines, guaranteeing results.

O. K. Full Size!!!

O. K.

NO ONE Denies this to be the only safe automatic in the **LAND**
Perfected Improvements Commend it to the Trade.
$6.00 EACH.
Discount (—).
A. L. BOGART,
22 Union Sq., N. Y.

ROYCE & MAREAN,
DEALERS IN
ELECTRICAL APPARATUS
Telegraph and Telephone Supplies,
No. 1408 Penna. Avenue,
Opp. Willard's Hotel. WASHINGTON, D. C.

NOTICE TO THE TRADE.

The injunction restraining me from the manufacture and sale of *PORCELAIN* electric burners for multiple gas lighting, obtained by A. L. Bogart in a suit instituted by him for an alleged infringement of Patent 119,561, *HAVING BEEN DISSOLVED BY REASON OF THE EXPIRATION OF THE SAID PATENT,* I am now making my latest burner of *PORCELAIN* as well as of *LAVA.*

My *FRICTIONAL ELECTRIC MACHINES* embrace the latest improvements in construction and design, and are the only ones now offered to the trade that are protected by *existing* letters patent.

CHARLES H. HINDS,
MANUFACTURING ELECTRICIAN,
418 W. 27th STREET, - - NEW YORK.

SILKS. Full assortment of different sizes and qualities on BRAIDER SPOOLS, ready for the machines, in Red, Yellow and Green. Other colors to order. Send for Sample and Prices.
WM. MACFARLANE & CO., 55 Mercer Street, New York, Mill, Yonkers, N. Y.

Detroit Electrical Works
MANUFACTURERS OF
ELECTRIC SUPPLIES,
INCLUDING
Medical Batteries, Skeleton and Box Bells, Burglar Alarms, House Annunciators, Fire Alarm Boxes, Pins and Brackets.
Insulated Magnet, Telephone and Electric Light Wire.
GENERAL OFFICES and FACTORY:
DETROIT, MICH.

FRESH TESTIMONIALS TO THE SUPERIORITY OF
SIMPLEX WIRE.

THE VIRGINIA ELECTRIC LIGHT & POWER COMPANY, OF RICHMOND, VA.
NEW YORK OFFICE, 63 WALL STREET.
New York, August 21st, 1888.

A. F. MASON, Esq.,
SIMPLEX ELECTRICAL CO.,
Boston, Mass.

Dear Sir:
I have been using the Simplex Wire on a large portion of our lines in Richmond, Va., for the past five months. I have taken daily tests of the insulation during that time. The longest single circuit I have is about five miles, and at no time has the insulation test ever been less than one megohm. I cannot speak too highly of the wire or its insulation. A large portion of it has been run through foliage and trees in the streets, and upon examination a few days ago I failed to find any place where the wire has been abraded by coming into contract with the branches of trees. My instrument does not measure over one meghom, and I cannot tell how much higher the insulation may have measured. One megohm on wires in circuit is euough for me.
Yours very truly,
W. H. COLE, *Superintendent.*

THOMSON-HOUSTON ELECTRIC CO.,
AUGUSTA, GA.
August 12th, 1888.

Dr. A. F. MASON,
SIMPLEX ELECTRICAL COMPANY,
328 Washington St., Boston, Mass.

Dear Sir:
We are using in our arc-lighting circuits about twenty (20) miles of your Simplex T. Z. R. wire.
We have feund the insulation a most perfect protection against moisture and the abrasion of small tree limbs.
Have used your wire in our station, for running through trees, on buildings and porches, under mouldings, etc., and through cellars, and we have never been able to discover a "ground" upon any circuit since our plant was put into operation.
Very truly yours,
JOHN H. WATERMAN.

ADDRESS,
The Simplex Electrical Co.,
328 WASHINGTON STREET, BOSTON, MASS.

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